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ABSTRACT

The manual was designed to aid members of admissions committees in the use of the new Medical College Admission Test (MCAT) for the selection of applicants, and to familiarize health professions advisors and other groups of the basic characteristics of the test and its selection and counseling functions. The first chapter includes a rationale for the development of the new test and test specifications and development information. Characteristics of the subtests and a comparison of the new and old test are also provided. Chapter 2 discusses the scoring procedures for the new test including methods of calculation, score reporting formats, and equivalence scales. In chapter 3 the technical considerations of the interpretation of the new test are assessed in areas such as reliability and independence of measured abilities. The fourth chapter surveys the normative considerations of interpretation including the use of the test by the undergraduate major, by racial and ethnic background, and by sex. Chapter 5 details the use of the new MCAT in admissions decisions. The final chapter presents preliminary research and implications on the test. Technical supplements provide facts on the speededness of the test, and methods for converting raw scores and equating successive forms of the test. Guidelines for calculating local norms are appended. (PHR)

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U.S. DEPARTMENT OF HEALTH EDUCATION & WELFARE NATIONAL INSTITUTE OF EDUCATION

NEW MEDICAL COLLEGE ADMISSION TEST

INTERPRETIVE MANUAL

HE 011 851

Division of Educational Measurement and Research

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The publication of this manual summarizes the efforts and contributions of numerous people who participated in the development of the New MCAT. The authors are fully aware that to review and describe previous events and further, to provide interpretive information in the context of this manual, does not bestow the appropriate recognition to all who have dedicated time in the formulation of the concepts included in this document. Particular recognition is given to Mr. James Angel and Dr. Mary Fruen for their leadership and effort during the development of the New MCAT.

Of special significance are the contributions of Marcia Lane, of the Division of Educational Measurement and Research, to the preparation of the manual. She dedicated extensive effort to the writing, organization, and production of this document. She was strongly supported in this endeavor by Dr. Robert Beran, Associate Director of the Division, under whose direct supervision the project was conducted. Special recognition is extended to Drs. Sandra Wilson, John Claudy, and William Shanner, of the American Institutes for Research, for their extensive contributions and counsel during the preparation of this publication. The authors are also grateful to the other staff members of the Association who contributed their valuable insights during the development of the manual. The authors are indebted to Becky Meadows, Tina Hein, and Debbie Jones for their untiring efforts in the typing of the numerous drafts and final manuscript.

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INTRODUCTION

The New MCAT Interpretive Manual has been designed primarily to aid members of admissions committees in the use of the New Medical College Admission Test (MCAT) for the selection of applicants. This document was additionally constructed to familiarize health professions advisors and other groups of New MCAT users with the basic characteristics of the test and its selection and counseling functions. The material presented in the Interpretive Manual includes a discussion of New MCAT development, descriptions of subtests and scoring procedures, guidelines to the interpretation of test results, distributions of scores from New MCAT administrations and selected data from research on the new test.

The Interpretive Manual is the second in the series of official publications relating to the new examination. The first publication, the New MCAT Student Manual , is directed primarily to examinees and their advisors. The student manual is equally important, however, for anyone engaged in the admissions process since it provides more detailed information on test content as well as illustrative items.

In order that it may be augmented as additional research data, technical information or other aids to interpreting New MCAT results become available, the Interpretive Manual is being distributed in loose leaf form. The AAMC will maintain an ongoing research program regarding the New MCAT and will encourage and facilitate cooperative studies with and among individual or groups of medical schools.

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CHAPTER 1

OVERVIEW OF THE NEW MCAT

Medical school admissions committees consider a variety of factors and utilize information from a variety of sources in the assessment of applicants to medical school. Each resource provides some indication of the applicant's adequacy of preparation and readiness to undertake the study and eventual practice of medicne. The New MCAT is intended to be used as one measure of the quality of the applicant's academic preparation. In order to meet the changing demands of medical school curricula and to reflect current patterns of medical practice, the New MCAT has been developed to incorporate many of the knowledge and skill elements which have been judged to be current prerequisites for medical study and practice.

RATIONALE FOR NEW MCAT DEVELOPMENT

Over the past several decades, the dramatic increase in scientific knowledge has greatly affected the study and practice of medicine. In addition to learning the fundamental scientific concepts within the basic and clinical sciences, the medical student must master the necessary skills to evaluate the results of current scientific research. Faced with a burgeoning body of scientific literature, the student and physician must continually exercise their problem solving and reasoning skills in the judgment of scientific findings and the application of those findings to patient care. The New MCAT was designed in response to the need for an instrument which would assist in more accurately assessing the medical school applicant's possession of prerequisite knowledge and skills. The goals for the development of New MCAT include: (1) the development of an assessment instrument to measure achievement levels and the expected prerequisites which are generally relevant to the study and practice of medicine, (2) the design of an instrument which would assess a precisely identified base of content manifested in all test forms and also possess the capability to respond to a changing base of scientific knowledge, and (3) the construction of a test whose results would identify strengths and weaknesses and thus aid in the counseling of examinees.

An additional goal in the development of the New MCAT was to insure overall quality of the examination by conformity with professional standards.* All applicable standards have been strictly adhered to throughout the developmental process of the New MCAT. In further compliance with these standards, ongoing research studies related to potential interpretations of the test will be conducted and monitored to provide technical and interpretive information on the New MCAT.

TEST SPECIFICATIONS AND DEVELOPMENT

The New MCAT was developed by the American Institutes for Research in the Behavioral Sciences (AIR), a nonprofit research organization at the direction of the AAMC and its membership. Procedures developed by AIR determined science knowledge prerequisites and the analytical skills upon which the examination is based. The involvement of many individuals from the AAMC constituency and undergraduate institutions was achieved through the various advisory, technical, and review committees associated with the development of the New MCAT.

The New MCAT test specifications give detailed descriptions of the knowledge and skills to be assessed by test items (questions). The preliminary science content outlines were prepared from curriculum materials of a representative sample of undergraduate colleges. To insure completeness and relevance to medical education, the outlines were rated by a select panel of undergraduate and graduate medical school faculty members, practicing physicians, and medical students. The outlines were reviewed, but not rated by undergraduate (baccalaureate) faculty members. As one criterion for rating the outlines, the panel identified the required knowledge and skills thought necessary for success as a medical student. The rating panel also made judgments about the same material with respect to its importance for the practice of medicine. The resulting weights were reviewed by expert committees in the determination of the final specifications.

The New MCAT items were written by faculty possessing expertise in the content areas being tested. Item writers were required to formulate questions within the limits of the test specifications.

*Standards for Educational and Psychological Tests prepared by a Joint Committee of the American Educational Research Association, the National Council on Measurement in Education, and the American Psychological Association.

The questions were reviewed for quality, content accuracy, technical soundness, adherence to specifications, and cultural and social bias by at least two additional faculty. Subsequently, the items were evaluated in developmental tryouts with groups of undergraduate students. The students attempted and then commented in detail on the items with regard to clarity, format, specific vocabulary, and fairness. A second tryout of the item was then carried out by administration to a sample of MCAT examinees. The final acceptance of an item for use in a form of the test was based on the data derived from all of these reviews and tryouts.

CHARACTERISTICS OF THE NEW MCAT

The New MCAT includes four major subtests: (1) Science Knowledge (assessment in Biology, Chemistry, and Physics), (2) Science Problems (assessment in knowledge and problem solving ability in biology, chemistry, and physics), (3) Skills Analysis: Reading, and (4) Skills Analysis: Quantitative. Although the New MCAT is administered in four subtests, evaluation is provided in six substantive areas. The assessment of the examinee's science knowledge and science problem solving skills, as measured by the New MCAT, accounts for four of the six scores that each examinee receives. Separate scores are provided for Biology, Chemistry, and Physics achievement and Science Problems. The precise meaning and derivation of each score is discussed in Chapter 2. The reporting of separate scores facilitates the identification of the examinee's strengths and weaknesses among the tested areas.

In addition to the assessment of science knowledge and problem solving skills, the New MCAT will provide measures of the examinee's skill in the comprehension, evaluation, and use of various types of information. Since the medical student and physician are continuously required to use resources presented in a variety of prose and graphic formats, the New MCAT attempts to measure the examinee's ability to analyze, understand, and draw conclusions from presented information. The information processing skills are tested in the Skills Analysis: Reading and Skills Analysis: Quantitative subtests of the New MCAT. Since the presentation of information in the Reading subtest is primarily in a prose format and the presentation in the Quantitative subtest is in graphic or tabular format, separate scores are reported for each subtest.

The New MCAT was developed so as to minimize cultural and social bias. Test development and advisory committees have had, and will continue to have, significant participation from underrepresented populations. Furthermore, the writing, editing, and testing of questions included in the New MCAT have undergone extensive examination by faculty and students from minority populations. Test performance among various examinee groups will be consistently monitored in an

effort to detect any previously undiscovered bias, that is, performance differences among groups which are not attributable to differential exposure to the content and skills covered by the new tests.

SUBTEST DESCRIPTIONS

The New MCAT Science Knowledge and Science Problems subtests are designed to assess the understanding and skills in certain domains of scientific facts, principles, and techniques learned at the introductory sciences level which have been judged to be prerequisite for the scientific competencies generally required in medical school. The application of these facts, principles, and techniques also underlies many of the diagnoses, therapeutic decisions, and procedures used in medical practice. The New MCAT Science subtests are composed of items which sample these domains in proportion to their rated importance for the mastery of subsequent competencies.

Science Knowledge

The three Science Knowledge areas of assessment (Biology, Chemistry, and Physics) reflect an individual's level of mastery of medically relevant scientific principles in the individual science domains, within the limits of reliability imposed by the numbers of items in each area of assessment. The Science Knowledge subtest consists of short, multiple choice questions. Successful performance requires the recall of facts, definitions and relationships, and the application of single facts, concepts, and principles to identify solutions or reach a conclusion in a familiar scientific situation.

Science Problems

The Science Problems subtest includes topics of general medical relevance presented as longer exercises and poses three multiple choice questions about the situation contained in the passage. Successful performance on the Science Problems subtest requires the ability to integrate several of the principles tested in the Science Knowledge subtest and to apply these principles to solve problems in novel and generally medically relevant situations. Correct responses to items in this subtest may require the knowledge and integration of several principles from one or more areas of biology, chemistry, and/or physics.

To aid in the proper interpretation of test results, it is useful for those involved in the admissions process to understand the content on which the test is based. The knowledge of the content being tested enhances the identification of individual strengths and weaknesses. The content upon which the two science subtests have been developed are noted in the outlines which appear below.

Biology Topics in New MCAT

I. Molecular Biology

A. Enzymes

General function and importance of enzymes in catalyzing biological reactions. Principles of enzyme specificity and active site model. Anaerobic and Aerobic metabolism.

B. Bioenergetics

Main function in conversion of organic energy sources into ATP storage form with CO_2 and H_2O as end products. Basic organization of pathways, including general distinctions between and functions of glycolysis, Krebs cycle, and electron transport chain.

C. Nucleic acids

Watson-Crick model of DNA as double helix and concept of semi-conservative (DNA) replication. General DNA and RNA composition. Nucleotide base pairing specificity.

D. Biosynthesis

DNA as template for RNA. Principles of transcription and translation. General roles of tRNA, mRNA, and ribosomes in the sequential steps of protein synthesis.

II. Cellular Biology

A. Eucaryotic cell

General defining characteristics. General structural and functional characteristics of subcellular organelles and structural constituents. The process of reproduction through mitosis and functions of the structures of the mitotic apparatus relative to this sequence. Very general characteristics of fungi and their life cycle.

B. Viruses and bacteria (procaryotes)

General defining characteristics of each. Life cycle and multiplication of a virus utilizing a host; basic distinctions between a bacteriophage and other viruses. General principles of bacterial reproduction. Bacterial classification by shape. *General* principles and significance of metabolic variability and genetic adaptability of bacteria.

III. Developmental and organismal biology

A. Embryology

Fertilization and zygote formation. Sequence and significant features during major embryonic stages after zygote formation; formation of primary germ layers and general development of structures from each layer. General mechanisms in and significance of determination, differentiation, tissue induction, and morphogenesis.

B. Respiratory, circulatory, lymphatic, renal, and skin systems

General characteristics of major structures in each system and their functions. Significance of and general mechanisms involved in homeostasis, osmoregulation, and thermoregulation. General body fluid composition and its regulation by these systems.

C. Digestive system

Major structural and functional characteristics. General mechanisms and sites of physical and chemical breakdown, nutrient absorption, and waste elimination. Major digestive enzymes, their sources and functions.

D. Skeletal and skeletal muscle systems

Major functional characteristics. General importance of different bone types. *General* organization of calcium/protein matrix in bone and major functional contractile elements in striated muscle. General muscle cell characteristics. Distinction between muscle types. Concepts of muscular tone, oxygen debt, and voluntary control. General features of antagonistic musculature.

E. Nervous and endocrine systems

Basic defining characteristics of endocrine glands. Identity of major endocrine glands and the effects of their hormonal products on target tissues. Concept of feedback loop. Major structural and functional characteristics of vertebrate nervous system. General concepts of sensor and effector neurons, reflex arcs and antagonistic nervous control. Basic nerve cell structure and the concept of the action potential.

F. Reproductive system

Basic male-female differences in vertebrate reproductive structures and gametogenesis. The process of meiosis and its significance. General function of reproductive structures in the processes from fertilization through birth.

IV. Behavior, population biology, and evolution

A. Behavior

Basic responses common to all living organisms. Distinctions between and significance of major innate and learned behaviors in animals, e.g., biorhythms, instinct, conditioning, imprinting, reasoning. Relation of increased neurologic development to vertebrate behavior. Behavioral relationships in populations, e.g., dominance, symbiosis, competition, predation.

B. Genetics

General characteristics of chromosomes, including concepts of gene, locus, allele, tetrad. Understanding and application of general Mendelian genetic principles of phenotype, genotype, dominance, wild type, recessiveness, homo- and heterozygosity, hybridization, gene pool, and genetic probability. Factors affecting genetic variability, e.g., segregation, assortment and recombination, crossover, mutation, sex-linkage, genetic drift, and cytoplasmic inheritance.

C. Evolution and comparative anatomy

Darwinian concepts of fitness and selection. General principles of factors contributing to evolution, e.g., speciation, adaptive radiation. Basic taxonomic relationships, e.g., phylum, class, order, family, genera, species. General adaptive significance of vertebrate body schemes. Major evolutionary changes in body system specialization.

I. Chemical properties of the elements

A. Atomic structure

Bohr structure of the hydrogen atom. Quantum numbers, ground and excited states. Absorption and emission spectra of atoms. Electronic structure of atoms.

B. Periodic table

Classification of elements into groups by electronic structure. Comparison of chemical characteristics of elements in groups. Variation of chemical properties (e.g., electron affinity, electronegativity) with group and period.

II. States of matter

A. Gas phase

Temperature and pressure (units). Behavior of an ideal gas (Ideal Gas Law). Kinetic molecular theory of gases. Deviation of real gas behavior from Ideal Gas Law. Behavior of mixtures of gases, partial pressure.

B. Condensed phases

Intermolecular forces in liquids and solids. Interionic forces in crystal structures.

C. Phase equilibria

Phase changes, phase diagrams. Freezing point and boiling point of pure substances. Colligative properties. Freezing point depression for solutions ($\Delta T_f = -ik_f m$), molality units.

III. Chemical reactions

A. Chemical compounds

Description of composition by percent weight, empirical formula, molecular formula. Mole, molecular weight, Avogadro's number.

B. Mass changes in chemical reactions - stoichiometry

Description of reactions by chemical equations. Balancing chemical equations. Oxidation-reduction reactions, disproportionation reactions.

C. Energy changes in reactions

Entropy, enthalpy, and free energy changes in chemical reactions. Spontaneous reactions. Heats of reaction, Hess' Law. Energy of bond formation.

D. Rate processes in chemical reactions - kinetics

Steps in chain reactions. Intermediates in reactions, rate determining step. Activation energy, the transition state, catalysts, enzymes. Equilibrium in reversible chemical reactions, the equilibrium constant. Application of LeChatelier's Principle.

IV. Aqueous solutions

A. Solubility

Ions in aqueous solution, hydration. Units used to describe concentration. Chemical separations, solubility product, common-ion effect.

B. Acids and bases

Brønsted-Lowry acids and bases, titration and neutralization, normality. Ionization of water, pH scale. Conjugate acids and bases, weak acids and bases, pK. Buffer systems.

C. Electrochemistry

Electrolytic cell, concentration cell, galvanic cell. Half-cell reactions, direction of electron flow, oxidation and reduction at electrodes. Faraday's law, reduction potentials, cell potential.

Organic Chemistry Topics in New MCAT

I. Structure and stereochemistry of covalently bonded molecules

A. Covalent bonding

Lewis dot structures, resonance. Pi and sigma bonding. Electronegativity and charge distribution. Partial ionic character. Dipole moment. Lewis acid, Lewis base.

B. Stereochemistry

Polarization of light, specific rotation. Isomers, stereoisomers, enantiomers. Racemic mixtures, separation by biological means.

II. Aliphatic and aromatic hydrocarbons

A. Alkanes

Nomenclature, physical properties. Combustion and substitution reactions. Stability of free radicals, ring strain.

B. Alkenes

Nomenclature, physical properties. Cis/trans isomerism, intermediate carbonium ion stability in reactions.

C. Benzene

Nomenclature of substituted benzenes. Resonance, delocalization of electrons, molecular geometry.

III. Organic compounds which contain oxygen

A. Alcohols

Nomenclature, acidity of alcohols, physical properties, and chain branching. Dehydration, oxidation, and substitution reactions.

B. Aldehydes and ketones

Nomenclature, physical properties. Acidity of the α hydrogen, carbanions. Nucleophilic addition reactions, oxidation.

C. Ethers

Nomenclature, physical properties.

D. Phenols

Nomenclature, physical properties. Acidity, hydrogen bonding.

E. Carboxylic acids

Nomenclature, physical properties. Acidity, effect of substituents. Hydrogen bonding and dimerization. Nucleophilic reactions, reduction, decarboxylation, esterification.

IV. Other organic compounds of biological importance

A. Amines

Nomenclature, physical properties. Basicity, stabilization of adjacent carbonium ions. Amide formation, alkylation.

B. Acid derivatives (amides, esters)

Nomenclature, physical properties. Nucleophilic substitution. Hydrolysis. Fats, saponification.

C. Amino acids and proteins

Acidic, basic, and neutral amino acids. Protein structure. Peptide linkage, hydrolysis. Dipolar ions, isoelectric point, electrophoresis.

D. Carbohydrates

Nomenclature and classification. Cyclic structure and conformation of hexoses. Epimers and anomers. Glycoside linkage, hydrolysis.

Physics Topics in New MCAT

I. Mechanics

A. Translational motion

Units and dimensions. Vectors, components, vector addition. Speed, velocity, acceleration. Motion in the case of uniform acceleration ($d = v_0t + \frac{1}{2}at^2 + d_0$).

B. Equilibrium

Translation equilibrium, rotational equilibrium. Force, analysis of forces acting on an object, Newton's first law. Statics problems involving tension or compression of structural components, torques.

C. Force and motion, gravitation

Mass, center of mass, Newton's second law ($F = ma$). Newton's third law. Law of gravitation ($F = K_G m_1 m_2 / r^2$), planetary motion. Weight, freely falling bodies, projectiles. Motion on an incline, friction.

D. Work and energy

Work. Kinetic energy ($KE = \frac{1}{2}mv^2$), gravitational potential energy ($PE = mgh$). Conservation of energy. Power.

II. Thermodynamics, bulk properties of matter

A. Thermodynamics

First and second laws of thermodynamics. Equivalence of energy units. Temperature scales, coefficient of expansion. Heat transfer: conduction, convection, radiation. Specific heat, heat of fusion, heat of vaporization. Specific heat of water (1 cal/°C - g).

B. Fluids and solids

Solids: density, elastic properties, elastic limit. Fluids: density, specific gravity, buoyancy, hydrostatic pressure (Pascal's law). Viscosity. Bernoulli's equation.

III. Electricity

A. Electrostatics

Charge, conductors, insulators. Coulomb's law ($F = q_1 q_2 / r^2$), electric field. Potential, potential difference. Electric dipole.

B. DC circuits

Current ($I = q/t$). Battery, internal resistance. Ohm's law ($I = V/R$). Resistors in parallel ($1/R = 1/R_1 + 1/R_2 + \ldots$) and in series ($R = R_1 + R_2 + R_3 + \ldots$), resistivity ($\rho = RA/L$). Capacitance, energy of a charged capacitor, capacitors in parallel and in series. Dielectrics.

C. AC circuits

Alternating currents, root mean square current, and voltage. Impedance. Resistance, capacitance, inductance. Oscillating circuits.

IV. Wave characteristics, sound optics

A. General wave characteristics

Simple harmonic motion: pendulum, Hooke's law force ($F = -kx$). General periodic motion: wavelength, frequency, velocity, amplitude, phase. Transverse and longitudinal waves. Superposition of waves: interference, resonance, standing waves, beats. Classifications of electromagnetic radiation, relationship of energy, and frequency. ($E = h\nu$).

B. Sound

Production of sound. Pitch, intensity, decibel scale. Speed of sound in solids, liquids, gases. Resonance, interference, beats. Doppler effect.

C. Optics

Reflection, refraction. Snell's law ($n_1 \sin \theta_1 = n_2 \sin \theta_2$). Total internal reflection. Mirrors and lenses: center of curvature, focal length, real and virtual images. Converging and diverging lenses, lens power in diopters, combinations of lenses.

V. Nuclear structure

Atomic number, atomic weight, isotopes. Neutrons, protons, other elementary particles. Radioactive decay, half-life, decay constant, fission process, absorption of charged particles and gamma rays by matter. Mass deficit, energy liberated, binding energy.

Skills Analysis: Reading and Quantitative

The two Skills Analysis subtests are designed to assess individual ability and skills in gathering, analyzing, evaluating, and using information. The New MCAT Skills Analysis items, presented in narrative or graphic/tabular format, were developed purposely and proportionately from various types of content areas. Content or subject matter for the Skills Analysis subtests is drawn from the natural sciences, social sciences, and medically and health-related topics. Natural science passages are drawn from biology, chemistry, and physics and cover topics such as significant discoveries, experimental methodology, and the contributions of science to the understanding and solution of health problems. Social science passages include social behavioral aspects of disease, and relevant areas of psychology, sociology, political science, anthropology, and economics. Medically related materials include areas such as medical research, treatment of disease, and public health issues. All topics are discussed at a general level rather than at a highly technical level. *Since all the information needed to answer the questions is included in the material presented, specific information in any of these areas is not necessary to perform well on these subtests.* The mixture of topics is intended to reflect the diversity of issues with which the medical student and physician are expected to be conversant.

The types of materials used in the Skills Analysis: Reading and Skills Analysis: Quantitative subtests are summarized in the first column of Table I-1. They differ in organization, extent of information included ("information density"), and purposes which they serve. These materials are considered representative of the types of resources which medical students and physicians encounter most frequently. Examples from the Reading and from the Quantitative subtests of the exam are shown in the second and third columns of Table I-1.

TABLE I-1

TYPES OF MATERIALS USED FOR SKILLS ANALYSIS: READING AND SKILLS ANALYSIS: QUANTITATIVE EXAMINATIONS

Types	*Examples from Reading Examination*	*Examples from Quantitative Examination*
Unsummarized, descriptive materials (possibly including irrelevant, inconsistent, or unreliable information), generally accumulated to maintain an original record for reference or research purposes.	Personal history, first-person account of event.	"Raw" empirical data, experimental results, characteristics of a population.
Condensed and summarized materials generally produced for reference purposes or to present a large amount of current, topical information.	Factual material organized for reference purposes such as entries in encyclopedias, handbooks, abstracts, newspapers.	Summary statistics or data, tables, graphs.
Materials organized around a research hypothesis, or an explanation for a viewpoint or course of action.	Argument-oriented materials such as journal articles, reviews, advertisements.	Tables, graphs, charts, diagrams, etc. constructed to show special relationships or aspects of data.
Topical materials sequenced for learning, generally factual, without explicit advocacy of a particular viewpoint.	Textbooks, self-instructional materials, class handouts.	Not used.

The skills to be assessed are those which have been rated by the medical education community as necessary for medical students and for physicians. They require that the following kinds of judgments be made concerning the information presented:

1. What ideas are presented by the material ?
   (Understanding)

2. Are specific interpretations relevant to the information presented ?
   (Relevance)

3. Are specific inferences fully justified by the information given ?
   (Corroboration)

4. Are specific conclusions or hypotheses consistent with all of the available information ?
   (Consistency)

5. Are specific interpretations as accurate as the information permits ?
   (Accuracy)

6. Are specific conclusions warranted by the information given, even if contradicted by common opinion or preconceptions ?
   (Objectivity)

7. What range and types of relations can be perceived among the various items in the information given ?
   (Perceptions of relations)

8. Can trends be recognized when present in a set of data, and are appropriate precautions observed in projecting such trends ?
   (Recognition of trends)

9. Can relevant facts be applied from more general knowledge in interpretation of particular information ?
   (Use of other relevant facts)

10. Is there a possibility of more than one hypothesis or course of action which may be consistent with the available information ?
    (Multiple hypotheses)

Specific college course work is not needed for these subtests and the level of mathematics required for the Skills Analysis: Quantitative subtest is noted below.

Knowledge of Mathematics Required for the New MCAT

1. An understanding of fundamental concepts in the following areas to the extent normally covered in a second-year high school algebra text: understanding of exponentials and logarithms (natural and base ten); scientific notation; graphic representations of data and functions - terminology (abscissa, ordinate, etc.); slope, rate of change, the use of arithmetic, semi-log and log-log scales.

2. The knowledge of the definitions of the basic trigonometric functions (sine, cosine, tangent); the values of the sines and cosines of 0°, 90°, and 180°; the relationships between the lengths of sides of right triangles containing angles of 30°, 45°, and 60°.

3. The use of metric units and common English units. The ability to balance equations containing physical units. Conversion factors between metric and English systems will be provided where needed.

4. An understanding of the relative magnitude of experimental error and the effect of propagation of error.

5. An understanding of the following descriptive concepts of statistics: the ability to interpret data presented in proportion or percentage form; the ability to determine the average (or arithmetic mean) of a set of quantitative data; and the ability to determine the range, relative variability, and relative accuracy (number of significant digits) of a set or sets of quantitative data. Computation of such statistics as the median, mode, or variance will *not* be required unless computation procedures or definitions are given with the questions. Additional statistical preparation will *not* be required.

6. An understanding of vector addition and subtraction is required. Dot and cross product are *not* required.

7. An understanding of calculus is *not* required.

The nature and purpose of the New MCAT suggests that examinees may need to prepare themselves differently for this type of test. It would be very difficult for individuals to cram for the New MCAT or any similar test (particularly with regard to the Skills Analysis subtests) which requires careful information processing, data assimilation, or the critical consideration of elements. A more profitable and hence preferred approach to achieving high New MCAT scores is for individuals to begin early in their educational program to become aware of the kinds of skills required to function adequately in an academic and professional setting and to work consciously on their development. This also implies that short term "preparation" courses for taking tests should be even less germane to individuals' needs for being prepared for the New MCAT, especially in the Skills Analysis and Science Problems subtests. Sharp cognitive skills and an appropriate fund of scientific knowledge should be the resources the individual brings to the examination.

COMPARISON OF OLD AND NEW MCAT

Any discussion of the New MCAT, at least at the initial stage, is certain to raise the question "Can direct comparison be made between old and New MCAT scores ?" If the New MCAT were a mere revision of the former MCAT cognitive battery, the problems associated with the transition between the two tests would be of minimal concern. However, the New MCAT departs from the objectives and content of the former MCAT in several significant ways. This section serves to explore differences in the old and new tests, and to explain why direct comparison of the two in terms of scoring, content or function is not sound.

The old MCAT was oriented toward general ability measures, with the limited objective of predicting success in the basic medical sciences. By contrast, the New MCAT is an outgrowth of the mounting recognition of the need to tie admissions decisions more explicitly to a broader range of characteristics important to the future performance of physicians. While maintaining the potential value of predicting success in the basic science years of medical school, the New MCAT is constructed to test quite specific cognitive skills and abilities considered important in all phases of medical education and by implication, in the practice of clinical medicine.

A consideration of the subtests of the old and new tests and the examination of the content outlines of the New MCAT reveals major differences between the two tests. Specifically, the Skills Analyses and Science Problems subtests of the New MCAT assess such abilities as information gathering and analysis, discerning and formulating relationships and other problem solving skill dimensions in their respective areas. These cognitive areas were not directly measured by the old MCAT. In the New MCAT, Science Knowledge is assessed by the individual scores in biology, chemistry, and physics based

upon a well defined and highly systematic content sampling. The old MCAT Science subtest presents a single score based upon variable content, making it impossible to interpret differential performance within the various science disciplines or to relate scores to any defined aspects of the premedical or medical curriculum. To illustrate the advantage of separate scores for each science area, consider the following example. An individual may have obtained a score at the mean of the old MCAT in the Science subtest because of average performance in all three science disciplines. Another individual may have performed especially well in biology and chemistry, but rather poorly in physics. The single Science score would probably have shown both students to be average. Interpretation of the single Science score of the old test obscures the fact that the second individual demonstrated significant strengths in two areas and a weakness in the third discipline. Information on the examinee's relative performance in the three sciences will be reported by the New MCAT.

Since the New MCAT reports three Science scores, it might seem that by combining these scores a valid comparison can be achieved with the score from the old MCAT. At least three critical factors serve to intervene:

1. Content of the new Science Knowledge areas of assessment is based on different factual elements than the old. Curriculum studies and ratings by expert judges have produced specifications for the new science tests which provide a constant science content base which is not directly comparable with the former MCAT science test.

2. Questions (items) used in the New MCAT vary greatly in format from the old. While examining the knowledge of concepts and facts, the New MCAT places much greater emphasis on assessing important skills in applying scientific information.

3. Averaging scores implies equal weights for each test, whereas in the old MCAT the components were differentially weighted, e.g., physics 15%, chemistry 45%, biology 40%.

It is possible to predict outcomes from highly divergent inputs, but it must be remembered that predicting performance on the new cognitive tests from the old MCAT may: (1) be possible for groups, but risky for individuals, (2) introduce a significant source of error based on the differences between the original test, and (3) run the risk of being interpreted as directly comparable measures of the same behaviors (those of the new cognitive battery).

Scores on the New MCAT differ from those of the old test in the number of score units reported and in their basic interpretation. The old MCAT scaled score values ranged from 205 to 795, suggesting that a single increment or decrement in scores represented a greater likelihood of a real difference in true ability than was actually justified. This implied a

a precision of measurement to admissions committees which encouraged the potential for differentiation which was not defensible, and thus fostered an over-reliance on small test score differences. The New MCAT scores present standardized information concerning the academic qualifications of examinees via a more realistic scaled score range and attempt to make score comparison a more defensible process.

Old MCAT scores carried with them a restriction common to all norm referenced tests: scores have meaning only in relation to the performance of other examinees in a designated reference population. In contrast to the old test, the content and skills specifications for the New MCAT have been precisely identified and published. Hence, New MCAT scores can be interpreted by admissions committees and premedical advisors as evidence of relative mastery of objectives, including those involving the knowledge of scientific facts and the demonstration of cognitive skills. In addition to supporting the selection of qualified applicants, the type of information derivable from New MCAT scores makes possible the identification of strengths and weaknesses of the examinee as well as the determination of his/her relative position within the applicant pool. If weaknesses in the individual's academic background are demonstrated, provisions for their remediation may be determined and implemented by the examinee, the undergraduate institution, or the medical school.

NEW MCAT SCHEDULE

TABLE I-2

NEW MCAT 1977 ADMINISTRATION SCHEDULE

Testing Session	*Title*	*Number of Questions*	*Maximum Time*
MORNING	1. Science Knowledge	125	135 Mins.
	Biology	(38)	
	Chemistry	(49)	
	Physics	(38)	
	Rest Period		10 Mins.
	2. Science Problems	66	85 Mins.
	Lunch Break		60 Mins.
AFTERNOON	3. Skills Analysis: Reading	68	85 Mins.
	Rest Period		10 Mins.
	4. Skills Analysis: Quantitative	68	85 Mins.

Table I-2 provides a current schedule for the 1977 administrations of the New MCAT, showing the number of questions and time limits for each section. The test is administered in two sessions separated by a break for lunch. In the morning, examinees take the Science Knowledge and Science Problems subtests. The afternoon session consists of the Skills Analysis: Reading and Skills Analysis: Quantitative subtests.

Time limits for each subtest have been established to provide examinees with ample time to complete the exam. For logistical reasons and uniformity in administrations, it is impossible to provide unlimited time for each subtest, but sufficient time is available for nearly all applicants to complete the tests.

An investigation of the performance of examinees in the Spring 1977 administration indicates that the New MCAT subtests are not speeded for the vast majority of examinees (see Technical Supplement I). Hence, the times listed in Table I-2 are adequate for nearly all examinees to complete New MCAT subtests.

CHAPTER 2

NEW MCAT SCORING PROCEDURES

Examinee performance on the New MCAT is summarized by six separate scores from the following areas:

* Biology Knowledge
* Chemistry Knowledge
* Physics Knowledge
* Science Problems
* Skills Analysis: Reading
* Skills Analysis: Quantitative

The relationship between the administrative pattern of New MCAT subtests and the determination of reported scores is illustrated in Table II-1 and is further explained in the following section.

TABLE II-1

Administration Pattern \ Scoring Pattern	Biology Scores	Chemistry Scores	Physics Scores	Science Problems Scores	SA: Reading Scores	SA: Quantitative Scores
Science Knowledge Subtest						
Biology	x					
Chemistry		x				
Physics			x			
Science Problems Subtest						
Biology	x_a				x_a	
Chemistry		x_b			x_b	
Physics				x_c	x_c	
SA: Reading Subtest					x	
SA: Quantitative Subtest						x

x_a = same set of biology items
x_b = same set of chemistry items
x_c = same set of physics items

METHOD OF CALCULATION OF NEW MCAT SCORES

Scores for the Biology, Chemistry, and Physics areas of assessment are derived by combining Science Knowledge items in each discipline with Science Problems questions from the respective disciplines. For instance, an examinee's Biology score reflects a combination of biology knowledge items and biology problems items. This combined score describes the examinee's preparation with respect to accomplishment in the field of Biology. Scores for the Chemistry and Physics areas of assessment are determined in a similar manner.

The Science Problems subtest score is a function of responses to items requiring the knowledge and integration of principles from one or more areas in biology, chemistry or physics. While measuring problem solving ability as well as science knowledge, the series of questions which make up the Science Problems subtest is organized around stimulus materials drawing upon the same knowledge base required by the Science Knowledge items in each discipline. The Science Problems subtest therefore performs a dual role. Although Science Problems items are not repeated within the test booklet, they are combined across disciplines to form a Science Problems subtest score, and contribute respectively to corresponding Science Knowledge scores.

All Skills Analysis: Reading items form one score, as do all Skills Analysis: Quantitative items. It must be emphasized that, with the exception of the specified background in mathematics cited in Chapter 1, examinees do not need prior knowledge of the materials from any source field utilized in the Skills tests, since the information needed for solving these problems is contained in the material presented. Examinees do need skills in analyzing and synthesizing data, a reading capacity that allows them to handle fairly complex materials readily, the ability to organize concepts and facts for purposes of decision-making and the specified mathematics background. Individuals whose academic preparation emphasizes the strengthening and expansion of these skills should find this to be a decided advantage in taking the New MCAT.

Raw (non-scaled) scores for each of the six New MCAT areas of assessment are determined by counting the number of correct answers. There is no penalty for incorrect responses or for omitted items. Individuals are therefore counseled to attempt to answer every question even though they may be uncertain about the correct response.

SCORE REPORTING FORMATS

Scaled Scores

The six New MCAT scores outlined in the previous section are reported on a 15 point scale; raw scores (the number of correct responses) are converted to an integer scaled score ranging from 1 (lowest) to 15 (highest). The conversion of raw New MCAT scores to scaled scores enhances the likelihood that two individuals of equal ability will achieve the same reported score, even though there might be slight differences in the raw scores which each of them obtained on the test. The use of scaled scores in reporting test results additionally facilitates the comparison of scores among subtests which may vary in the number of items or with respect to other dimensions such as variability of scores within a given subtest. The New MCAT score scale was designed so that a sufficient number of minimally acceptable and usable score reporting points are presented and thus, to discourage the misuse of reported results. A rationale for the selection of the score reporting scale, a discussion of the mechanism of assigning scaled scores to intervals of raw scores and related implications for differentiating individual levels of performance follows in Technical Supplement I.

New MCAT Percentile Rank Ranges

To aid in the interpretation of scaled scores, tables relating scaled score values and percentile rank* ranges have been supplied to test users. These scores are based on the performance of all examinees taking the New MCAT at specified test administrations. In order that each examinee's performance may be compared with that of all individuals currently taking the test, the percentage of examinees receiving each scaled score and percentile rank ranges are also provided to examinees, health professions advisors, and medical school admissions officers. Utilizing appropriate percentile rank range information, one may ascertain what percentage of the examinees scored at a given scaled score as well as the percentage scoring above and below that point. One basic advantage in the reporting of percentile ranks along with scaled scores is the ease with which they are interpreted. Establishing an examinee's rank in an appropriate reference group yields a straightforward and meaningful index of relative test performance.

Although there are certain advantages to the use of percentile ranks, several limitations on their proper interpretation should be kept in mind. First, since percentile ranks are ordinal measures of performance, they do not represent equal sized units. For this reason, percentile ranks as measures of performance cannot be legitimately added, subtracted, multiplied,

* A percentile rank indicates the percentage of examinees falling at or below given scaled score value.

or divided.

A second caution concerning the use of percentile ranks relates more to their interpretive function. Because the units of scale of percentile ranks and of scaled scores are not directly comparable, small scaled score differences near the center of the distribution produce rather large percentile rank differences associated with them, while large score differences at the ends of the distribution produce relatively minor rank differences. Unless the relationship between the distribution of reported score values and percentile values is considered when interpreting scores, differences between individual percentile ranks can be misinterpreted or overinterpreted, particularly when considering the seemingly great differences in percentiles at the center of the distribution. Special caution should therefore be exercised in establishing cut-off points for any subtest at or near the 50th percentile.

EQUIVALENCE OF NEW MCAT FORMS

The New MCAT, in all its forms, is constructed so that individual scaled scores will have the same meaning from one test administration to the next, thereby making possible the comparison of examinees who take the test at different times. A score of 14 in Science Problems, for example, indicates an equivalent level of achievement regardless of the test administration in which it is obtained. The following are the basic criteria utilized in constructing equivalent New MCAT forms: (1) the content of each form is held constant at the pre-determined number of items for each content and/or skill area; (2) all items on one form are independent of items on another form; (3) significant item statistics are alike for all forms; (4) the total time allotted for reading the stimulus materials will be the same for all forms and; (5) the average number of response options per item are equivalent among all forms. A more technical discussion of the mechanism for the generation of equivalent forms and related implications for interpretation of scores is contained in Technical Supplement II.

New MCAT Standardization Group

In order to facilitate the comparison of performance on various New MCAT administrations, scores were standardized on the 30,599 examinees who took the test on April 30, 1977. These standardized scores (scaled scores) were set so that on each of the six areas of assessment the mean scaled score was 8.0 and the standard deviation approximately 2.5. Table II-2 indicates the distributions of scaled scores on the New MCAT for the April 1977 group. The scaled score means and standard deviations are expected to change as the

Table II-2

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY SUBTEST

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	**Scaled Score**
15	0.0		0.0	99.9	0.7	99.4-99.9	0.1	99.9					15
14	0.1	99.9	0.3	99.8-99.9	1.6	97.8-99.3	0.4	99.6-99.9	0.0	99.9	0.0	99.9	14
13	1.0	99.0-99.9	2.8	98-99.7	2.8	96-97.7	2.6	98-99.5	0.4	99.7-99.9	1.0	99.1-99.9	13
12	4.4	95-98.9	5.7	92-97	4.6	91-95	4.5	93-97	3.9	97-99.6	4.6	95-99.0	12
11	9.6	86-94	9.4	83-91	6.8	85-90	10.4	83-92	7.5	89-96	10.5	85-94	11
10	14.1	72-85	12.3	71-82	9.1	75-84	11.1	72-82	18.7	71-88	15.3	69-84	10
9	15.6	56-71	13.9	57-70	15.9	60-74	16.7	55-71	14.8	56-70	16.3	53-68	9
8	14.1	42-55	13.7	43-56	14.2	45-59	12.9	42-54	19.8	36-55	14.7	38-52	8
7	12.3	30-41	13.0	30-42	14.1	31-44	12.0	30-41	13.9	22-35	11.7	27-37	7
6	12.9	17-29	11.1	19-29	12.9	18-30	12.5	18-29	6.3	16-21	8.8	18-26	6
5	6.9	10-16	8.1	11-18	9.7	9-17	7.3	11-17	6.3	9-15	7.7	10-17	5
4	4.6	5-9	5.6	5-10	6.2	2-8	6.1	4-10	2.6	7-8	3.8	7-9	4
3	2.6	1.8-4	2.9	1.4-4	1.2	0.3-1	2.4	1.2-3	2.5	3.4-6	2.3	3.3-6	3
2	1.2	0.6-1.7	1.2	0.2-1.3	0.2	0.1-0.2	1.0	0.2-1.1	1.0	2.4-3.3	1.8	1.5-3.2	2
1	0.5	0.0-0.5	0.1	0.0-0.1	0.0	0.0	0.1	0.0-0.1	2.3	0.0-2.3	1.4	0.0-1.4	1
	Scaled Score Mean = 8.0 Std. Deviation = 2.43		**Scaled Score** Mean = 8.0 Std. Deviation = 2.56		**Scaled Score** Mean = 8.0 Std. Deviation = 2.52		**Scaled Score** Mean = 8.0 Std. Deviation = 2.52		**Scaled Score** Mean = 8.0 Std. Deviation = 2.41		**Scaled Score** Mean = 8.0 Std. Deviation = 2.53		

ability of the examinee group changes; therefore, the proportion of examinees that achieve a given scaled score is expected to change from one administration to another. Individual scaled scores will continue to reflect the same absolute level of student ability in a particular area established by the reference group regardless of the performance of future groups. For example, a scaled score of 6 in Biology in 1980 will reflect the same absolute level of ability as a scaled score of 6 in Biology in 1977. However, the proportion of examinees achieving a score of 6 may change in 1980. The performance of the standardization group is additionally described by the percentile rank information accompanying scaled scores in Table II-2.

CHAPTER 3

INTERPRETATION OF NEW MCAT SCORES - TECHNICAL CONSIDERATIONS

The New MCAT, like other standardized tests, measures only a portion of an examinee's knowledge and ability. An examinee's set of scores will be fallible measures of true ability due to such factors as poor health on the test date or lack of full understanding of test instructions, or to such testing related factors as the particular selection of questions or test room conditions. Since uncontrollable factors in educational testing render it impossible to develop tests with perfect precision, the set of scores reported for each individual should be considered as an estimate of his/her true ability rather than an infallible measure.

RELIABILITY OF NEW MCAT SCORES

Reliability coefficients for the six New MCAT scores for the Spring 1977 examinee group are reported in Table III-1. Since the New MCAT subtests are not speeded, both the split-half and coefficient alpha (KR-20) methods of calculating reliability are appropriate and are reported here. They have been found to yield essentially identical results.

The magnitude of a reliability coefficient is influenced by several factors. Some of these factors are inherent in the test, such as the nature of the items, the number of items, the number of response options, etc. The conditions of administration also exert an influence. Given the test instrument and administration conditions, however, the magnitude of the reliability coefficient will be influenced by the heterogeneity of ability of the group tested. The narrower the range of abilities of the group (and hence the scores), the lower the reliability coefficient. This can be observed in the comparatively lower coefficient for the reading test, where the examinee group exhibits more uniformly high ability than on the other tests. In this particular instance, the Skills Analysis: Reading subtest provides a relatively more stable estimate of the score of an examinee who scores below the mean (8.0) than of an individual who scores above the mean, assuming a retake of the test without further preparation.

TABLE III-1

RELIABILITY COEFFICIENTS FOR THE NEW MCAT SPRING 1977

(N= 30,599 - Spring 1977 Examinees)

Area of Assessment	r[a]	r[b]	Mean	Standard Deviation	Standard Error[c] of Measurement
Skills Analysis: Reading	.76	.76	8.0	2.4	1.2
Skills Analysis: Quantitative	.81	.82	8.0	2.5	1.1
Biology	.81	.82	8.0	2.4	1.0
Chemistry	.86	.86	8.0	2.6	.9
Physics	.83	.83	8.0	2.5	1.0
Science Problems	.82	.82	8.0	2.5	1.0

a Reliability coefficient computed by the split-half method and corrected by the Spearman-Brown formula. The tests were split so that the two halves were equivalent with respect to the content areas included. Further, the Skills Analysis: Reading, Skills Analysis: Quantitative and Science Problems sets were split so all items for a given passage were in the same test half.

Spearman-Brown reliability estimate, $r = \frac{2r_{12}}{1 + r_{12}}$

where: r_{12} = raw score product moment correlation between test halves

b Reliability coefficient computed via coefficient alpha (KR20)

c Standard error of measurement in scaled score units computed by the formula

$$SE_M = SD\sqrt{1 - r}$$

where r is the split-half reliability coefficient.

INTERPRETATION OF NEW MCAT SCORES USING THE STANDARD ERROR OF MEASUREMENT

For practical purposes a useful indication of the reliability of a test score is the standard error of measurement (SE_M). This is a statistical estimate of the relationship of an examinee's obtained score to his/her theoretical "true" score. The 15-interval scale on which all New MCAT scores are reported was designed so that one scaled score point would represent an interval approximately 1 SE_M wide. The relationship between the standard error of measurement and the magnitude of scaled score intervals is further explained in Technical Supplement I. The standard errors of measurement in scaled score units which were obtained for the Spring 1977 examinee group are shown in Table III-1. Since all are close to 1, for purposes of practical application one may consider one scaled score unit to be one standard error of measurement.

The probability that an examinee's true score is within ± 1, ± 2, or ± 3 scaled score points of their observed score is given in Table III-2 for each of the New MCAT areas of assessment. The values in this table are most appropriately used as an indication of the probability that an examinee would receive scaled scores differing by a maximum of ± 1, ± 2, or ± 3 if they should take the New MCAT again without intervening experience.

The practical advantage of the standard error of measurement when used in this context is that the resulting interval surrounding the reported score reminds the user that New MCAT scores, like scores for all standardized tests, are approximate interval estimates of performance rather than precise and absolute measures. Furthermore, the application of the standard error of measurement concept additionally encourages the user of standardized test scores to look for a consistent pattern of data rather than to make decisions on the basis of any one measure.

INDEPENDENCE OF MEASURED ABILITIES

The several New MCAT subtest scores are useful in conjunction with each other to the extent that they show low intercorrelations. Within the same New MCAT administration, if two subtests correlate highly, knowing a person's score on one subtest would be sufficient, normally, to estimate their score on the other, and there would be little justification for allocating the time and expense necessary for the additional testing or the reporting of additional subtest scores. On the other hand, there tends to be some amount of general ability which underlies performance in many ostensibly different kinds of testing situations and academic achievement areas. Thus, most subtests like those in the New MCAT will show some modest amount of intercorrelation due to this underlying ability.

TABLE III-2

PROBABILITY THAT AN EXAMINEE'S SCORE ON RETESTING WITH THE NEW MCAT WOULD LIE WITHIN ±1, ±2 or ±3 SCALED SCORE POINTS OF THEIR OBSERVED SCORES

(N = 30,599 - Spring 1977 Examinees)

Area of Assessment	Observed Scales Score Difference		
	1	2	3
Skills Analysis: Reading	.79	.96	.996
Skills Analysis: Quantitative	.83	.98	.999
Biology	.87	.99	.999
Chemistry	.90	.99	.999
Physics	.87	.99	.999
Science Problems	.87	.99	.999

The intercorrelations of results (scaled scores) on the New MCAT areas of assessment are shown in Table III-3 for the entire Spring 1977 examinee population. The intercorrelations vary between .50 and .73, and generally demonstrate that the abilities measured by the various areas of assessment are sufficiently different to justify their inclusion and the reporting of six discrete scores. This was of course the intention in the development of the battery. The intercorrelations of the three separate Science Knowledge scores are of particular interest and on the basis of their intercorrelations, certainly support the decision to introduce the differential testing of science achievement in the New MCAT. Biology and Physics scores in particular show a relatively low intercorrelation. Because the various science content domains even within one science field are somewhat independent from a conceptual and an instructional standpoint, it is logical to anticipate that mastery of one science domain or field does not necessarily imply mastery of the others. Low science intercorrelations can also be accounted for by the fact that not all examinees have completed the basic science prerequisites in each discipline at the time they take the test. However, positive relationships among the science scores will exist to the extent that examinees

have been uniformly exposed to all of the relevant materials and to the extent that there are different levels of general skills in applying knowledge which exist among individuals even with comparable instructional exposure.

The intercorrelations presented in Table III-3 also tend to reflect the varying computational and quantitative requirements of each of the six areas of assessment. The Physics, followed by the Chemistry, and Science Problems items require computation or judgments based upon quantitative information much more frequently than do the items in Biology. And of course such skills are involved in the Quantitative but not the Reading subtest.

TABLE III-3

SCALED SCORE INTERCORRELATIONS AMONG NEW MCAT AREAS OF ASSESSMENT

(N = 30,599 - Spring 1977 Examinees)

Area of Assessment	SA: Reading	SA: Quantitative	Biology	Chemistry	Physics
SA: Quantitative	.65				
Biology	.58	.65			
Chemistry	.54	.69	.69		
Physics	.50	.68	.61	.73	
Science Problems	.59	.73	___a	___a	___a

a Correlations of Science Knowledge Scores with Science Problems are not presented since Science Problems are included as part of the Science area scores and part-whole correlations lack statistical meaning in this context.

DIFFERENTIAL EFFICIENCY OF THE SUBTESTS

In order to use the New MCAT tests scores in conjunction with each other, it is helpful to consider the differential efficiency of the subtests, that is, the extent to which the various subtests differentiate among applicants. Another way of looking at this is to consider the differences between the scaled scores of examinees for each of the twelve possible pairs of independent scores. These differences in part represent real differences in ability and in part are chance differences attributable to the fact that each area of assessment score is not perfectly reliable. The proportion of the observed scaled score pair differences in excess of chance can be computed, and the higher these proportions the greater the differentiating power of the subtests. The values of these proportions computed for the Spring 1977 examinee population are given in Table III-4. A minimum acceptable criterion for the use of the test scores for the purpose of differential diagnosis of examinee strengths and weaknesses is that these proportions should be in excess of 25%. The proportions for the New MCAT battery are all between 49% and 58%, indicating that it is quite appropriate and efficient to interpret the scores of individual examinees as indicative of their pattern of strengths and weaknesses in the areas tested.

TABLE III-4

PERCENTAGES OF OBSERVED DIFFERENCES IN INDIVIDUAL SCORES IN EXCESS OF THE EXPECTED CHANCE PERCENTAGES

(N = 30,599 - Spring 1977 Examinees)

Area of Assessment	SA: Reading	SA: Quantitative	Biology	Chemistry	Physics
SA: Quantitative	52				
Biology	52	52			
Chemistry	58	53	53		
Physics	57	52	54	52	
Science Problems	53	49	___a	___a	___a

a Not calculated because of part-whole nature of these pairs of New MCAT scores.

INTERPRETATION OF DIFFERENCES BETWEEN NEW MCAT SCALED SCORES

As a part of the admissions process two basic types of questions are often asked about the medical school applicants. These are:

1. Given their New MCAT scores, does applicant A possess more (or less) of the ability measured by a given subtest than does applicant B? (Are there significant inter-individual differences? The discussion presented on pages 3-1 to 3-4 dealt with intra-individual differences on the same subtest.)

2. Given an applicant's New MCAT scores, does the applicant possess more (or less) of the ability measured by Subtest X than that measured by Subtest Y? (Are there significant intra-individual differences between subtests?)

Because tests are not perfectly reliable, it is not possible to answer these questions in absolute terms. However, they can be answered in terms of probability or confidence levels.

Table III-5 below serves to answer the first of the questions raised above by reporting probabilities for various observed score differences. For example, assume that examinee A receives a score of 10 on the New MCAT Biology area of assessment while examinee B receives a score of 11. What is the probability that this difference of one scale score point represents a "true" difference in Biology ability? Reference to Table III-5 indicates that an observed scaled score difference of one point on the Biology area of assessment represents a .52 probability of a true difference in ability. Likewise, an observed scaled score difference of three points on the Skills Analysis: Quantitative subtest corresponds to a .95 probability that the two examinees differ in the ability underlying the subtest.

TABLE III-5

PROBABILITY THAT AN OBSERVED SCALED SCORE DIFFERENCE BETWEEN TWO NEW MCAT EXAMINEES REPRESENTS A TRUE DIFFERENCE ON THE ABILITY UNDERLYING EACH NEW MCAT AREA OF ASSESSMENT

Area of Assessment	Observed Scaled Score Difference				
	1	2	3	4	5
Skills Analysis: Reading	.44	.76	.92	.98	.997
Skills Analysis: Quantitative	.48	.80	.95	.99	.999
Biology	.52	.84	.97	.99	.999
Chemistry	.57	.88	.98	.99	.999
Physics	.52	.84	.97	.99	.999
Science Problems	.52	.84	.97	.99	.999

In order to answer the second type of question -- does a single examinee vary in ability level from subtest to subtest within the MCAT battery? -- a similar table can be constructed. The complete table would have one row for each of the possible pairs of areas of assessment, a total of 15 rows. However, the results are so consistent from pair to pair that the median value can be used for all twelve possible pairs of independent areas of assessment. These values are presented in Table III-6.

TABLE III-6

PROBABILITY THAT AN OBSERVED SCALED SCORE DIFFERENCE BETWEEN ANY TWO NEW MCAT AREAS OF ASSESSMENT FOR A SINGLE EXAMINEE REPRESENTS A TRUE DIFFERENCE ON THE ABILITIES UNDERLYING THEM

	Observed Scaled Score Difference				
	1	2	3	4	5
Median	.50	.82	.96	.99	.999
Range (12 possible paired differences)	.47-.53	.79-.85	.94-.97	.99-.99	.999-.999

From the figures presented in Tables III-5 and III-6 it is clear that scaled score differences of only 1 point will reflect a true difference in ability only about 50% of the time while there is an extremely high probability that differences equal to or larger than 3 scaled score points reflect a true difference. In most instances, in the absence of conflicting information, a scaled score difference of 2 points should be accepted as representing a true difference.

CHAPTER 4

INTERPRETATION OF NEW MCAT SCORES: NORMATIVE CONSIDERATIONS

In addition to the bases for interpretation of scaled scores outlined in Chapter 3, the evaluation of New MCAT scores of the individual applicant or the comparison of scores between applicants may be enhanced through the use of score distributions for appropriate reference groups. The normative information presented for the New MCAT in this chapter permits the comparison of individual scores with the total group of examinees taking the New MCAT, and/or within various national subpopulations.

USE OF NEW MCAT NATIONAL NORMS

The tables presented in the following sections present percentile rank* data for the total April 1977 examinee group and for national subgroups by: undergraduate major, college status, racial/ethnic, and sex categories. Although these data are based upon one test administration, they were found to be representative of expected performance on New MCAT subtests. It is important to note that New MCAT performance for the spring 1977 examinee group, used in the context of admissions decisions, demonstrates a wider range of abilities (more heterogeneity) than would be observed either in the applicant pool or the accepted applicant group.

In each table providing normative data, the percentage of examinees receiving each scaled score, associated percentile rank* ranges, scaled score means, and standard deviations are provided by area of assessment. To facilitate the use of this information, the following example is presented to assist in the interpretation of the data included in this chapter. Consulting Table IV-1 under the Science Problems subtest, a scaled score of 12 indicates that examinees recording this level of performance are superior to 92% of all examinees taking the Science Problems subtest for the April 1977 administration. Similarly, an examinee receiving a scaled score of 1 on this subtest ranks with the lowest .1 percent of all examinees. For each scaled score, a range of percentile ranks associated with that score is also presented. A scaled score of 10 in Science Problems indicates that while 11.1 percent of all examinees received that score, individuals in that score interval achieved a level of performance better than 71% of all examinees. One may also infer from the range of percentile ranks associated with a scaled score of 10 that approximately 18% of examinees achieved a higher level of performance. Interpretation of scores on the remaining five areas of assessment for the total population as well as for specific national subgroups can be obtained by consulting the appropriate data tables.

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*A percentile rank indicates the percentage of examinees falling at or below a given scaled score level.

Use of Local Norms in the Interpretation of New MCAT Scores

As a supplement to observing the performance of all New MCAT examinees or of various subpopulations, it may be useful to generate local norms or distributions of scores based upon groupings of examinees from a specified locality or applicants to a particular institution. The derivation of local norms would be particularly applicable for schools accepting applicants from a relatively narrow range of individuals. For optimal utilization of New MCAT scores in these instances, it may be desirable for each admissions office to develop tables similar to those presented in this chapter based upon its local acceptance patterns. In this context, local norm tables should be based on an adequate number of individuals since small numbers are problematic in attempting score comparisons among various subgroups. Guidelines for the preparation of local norm tables are given in Appendix A.

NEW MCAT SCORES BY UNDERGRADUATE MAJOR

Score distributions for New MCAT examinees by undergraduate major are presented in Tables IV-2 to IV-7. To briefly describe some of the highlights of these data: examinees indicating majors in the Humanities (2.3% of all spring 1977 examinees) achieve a higher level of performance in the Skills Analysis: Reading subtest than those from any other undergraduate major. Correspondingly, majors in the Physical Sciences (19%) and in Mathematics and Statistics (1%) demonstrate higher New MCAT scores in the science areas of assessment and on the Skills Analysis: Quantitative subtest than examinees in other majors.

NEW MCAT SCORES BY COLLEGE STATUS

Tables IV-8 to IV-11 illustrate New MCAT score distributions by college status. In general, it would appear that the lower the level in college, the higher the New MCAT score on nearly every area of assessment. The disparity in scores between the groups is least apparent on the Skills Analysis: Reading subtest and is most discernible in the science areas of assessment where the Sophomores and Juniors clearly demonstrate superior performance. This higher level of performance in the science areas may reflect a greater level of self-selection operating at the sophomore and junior levels (only those most confident of their preparation take the exam) as well as the possibility that these groups have had a more recent exposure to scientific coursework than the others. Sophomores comprised 5% of the April 1977 examinee population, Juniors 57%, Seniors 18.9%, and Graduates 18.3%.

NEW MCAT SCORES BY RACIAL/ETHNIC BACKGROUND

New MCAT score distributions for selected ethnic/racial categories are presented in Tables IV-12 to IV-20. White examinees compose the majority (84.7%) of all individuals taking the test in April of 1977. The second and third largest examinee groups were represented by Blacks (5.6%) and Asian or Pacific Islanders (4.7%). The patterns observed regarding New MCAT performance across racial/ethnic categories remain reasonably constant when controlling for performance by level in college and by undergraduate major. The magnitude of the differences between subgroup performance when evaluated in standard deviation units as well as the direction of such differences are quite similar to expectations that might arise from previous experience in related areas.

The score distributions presented in this section have been disseminated so that group similarities and differences in performance on the New MCAT may be considered in admissions decisions. The provision of ethnic subgroup data is one result of an effort to provide additional dimensions to these considerations. If the performance on the New MCAT is utilized to facilitate the counseling of examinees, the evaluation of other subgroup data pertaining to a specific examinee must be undertaken. This is particularly important in the counseling of subgroups of examinees who, because of societal and environmental factors, are considered educationally disadvantaged. The use of New MCAT scores by national and subgroup categories and for educationally disadvantaged groups in admissions decisions is discussed in Chapter 5.

Special caution must be exercised in evaluating aggregate performance of any racial/ethnic subgroup. Since test scores provide insight into only one aspect of an individual's preparedness for the study of medicine, generalizations drawn from the aggregate performance of any single racial/ethnic category could lead to a totally erroneous assessment of the unique qualifications and experience which each candidate possesses as well as a misassessment of the potential for the study of medicine of any given subgroup.

NEW MCAT SCORES BY SEX

When the national profile is considered (Tables IV-21 to IV-22), males register higher New MCAT scores on the four science areas of assessment and on the Skills Analysis: Quantitative subtest. Female examinees demonstrate a higher level of performance on the Skills Analysis: Reading subtest. These patterns are still in evidence when the effects of undergraduate major are considered by comparing the performances of the sexes within majors. Males composed 74.2% of the total examinee population while Females represent 25.8%.

TABLE IV-1

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY SUBTEST

APRIL 1977

Scaled Score	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		Scaled Score
	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	
15	0.0		0.0	99.9	0.7	99.4-99.9	0.1	99.9					15
14	0.1	99.9	0.3	99.8-99.9	1.6	97.8-99.3	0.4	99.6-99.9	0.0	99.9	0.0	99.9	14
13	1.0	99.0-99.9	2.8	98-99.7	2.8	96-97.7	2.6	98-99.5	0.4	99.7-99.9	1.0	99.1-99.9	13
12	4.4	95-98.9	5.7	92-97	4.6	91-95	4.5	93-97	3.9	97-99.6	4.6	95-99.0	12
11	9.6	86-94	9.4	83-91	6.8	85-90	10.4	83-92	7.5	89-96	10.5	85-94	11
10	14.1	72-85	12.3	71-82	9.1	75-84	11.1	72-82	18.7	71-88	15.3	69-84	10
9	15.6	56-71	13.9	57-70	15.9	60-74	16.7	55-71	14.8	56-70	16.3	53-68	9
8	14.1	42-55	13.7	43-56	14.2	45-59	12.9	42-54	19.8	36-55	14.7	38-52	8
7	12.3	30-41	13.0	30-42	14.1	31-44	12.0	30-41	13.9	22-35	11.7	27-37	7
6	12.9	17-29	11.1	19-29	12.9	18-30	12.5	18-29	6.3	16-21	8.8	18-26	6
5	6.9	10-16	8.1	11-18	9.7	9-17	7.3	11-17	6.3	9-15	7.7	10-17	5
4	4.6	5-9	5.6	5-10	6.2	2-8	6.1	4-10	2.6	7-8	3.8	7-9	4
3	2.6	1.8-4	2.9	1.4-4	1.2	0.3-1	2.4	1.2-3	2.5	3.4-6	2.3	3.3-6	3
2	1.2	0.6-1.7	1.2	0.2-1.3	0.2	0.1-0.2	1.0	0.2-1.1	1.0	2.4-3.3	1.8	1.5-3.2	2
1	0.5	0.0-0.5	0.1	0.0-0.1	0.0	0.0	0.1	0.0-0.1	2.3	0.0-2.3	1.4	0.0-1.4	1
	Scaled Score Mean = 8.0 Std. Deviation = 2.43		**Scaled Score** Mean = 8.0 Std. Deviation = 2.56		**Scaled Score** Mean = 8.0 Std. Deviation = 2.52		**Scaled Score** Mean = 8.0 Std. Deviation = 2.52		**Scaled Score** Mean = 8.0 Std. Deviation = 2.41		**Scaled Score** Mean = 8.0 Std. Deviation = 2.53		

TABLE IV-2

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT
FOR BIOLOGY & BIOLOGICAL SCIENCES MAJORS N= 17447 (57%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15					0.4	99.5-99.9	0.0	99.9					15
14	0.1	99.9-99.9	0.2	99.8-99.9	1.2	98.3-99.4	0.3	99.7-99.9					14
13	1.2	98.7-99.8	2.2	97.6-99.7	2.1	96.2-98.2	2.3	97.4-99.6	0.3	99.7-99.9	0.8	98.6-99.3	13
12	5.0	95-98.6	5.0	93-97.5	3.8	93-96	4.3	94-97	3.7	97-99.6	3.9	96-98.5	12
11	10.4	84-94	8.7	84-92	6.1	87-92	10.2	84-93	7.3	90-96	9.9	86-95	11
10	15.4	69-83	11.9	73-84	8.6	79-86	11.2	73-83	18.1	71-89	14.7	71-85	10
9	16.3	53-68	13.8	59-72	15.6	63-78	16.7	56-72	15.2	56-70	16.1	55-70	9
8	14.2	38-52	13.9	45-58	14.6	48-62	13.3	43-55	19.5	37-55	15.1	40-54	8
7	11.7	27-37	13.5	32-44	15.3	33-47	12.2	30-42	14.2	23-36	12.3	28-39	7
6	12.1	15-26	11.9	20-31	13.9	19-32	12.6	18-29	6.5	16-22	9.4	18-27	6
5	6.1	8-14	8.7	11-19	10.5	9-18	7.3	11-17	6.6	9-15	8.1	10-17	5
4	4.0	3.5-7	6.0	4.2-10	6.6	1.2-8	6.3	3.3-10	2.7	5.9-8	3.9	5.2-9	4
3	2.1	1.4-3.4	2.9	1.3-4.1	1.0	0.2-1.1	2.2	1.1-3.2	2.5	3.4-5.8	2.1	3.1-5.1	3
2	0.9	0.5-1.3	1.1	0.2-1.2	0.1	0.0-0.1	.9	0.2-1.0	1.0	2.4-3.3	1.6	1.5-3.0	2
1	0.4	0.0-0.4	.1	0.0-0.1	0.0	0.0-0.0	.1	0.0-0.1	2.3	0.0-2.3	1.4	0.0-1.4	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 8.15 Std. Deviation = 2.37		Mean = 7.87 Std. Deviation = 2.49		Mean = 7.79 Std. Deviation = 2.38		Mean = 7.99 Std. Deviation = 2.45		Mean = 7.95 Std. Deviation = 2.39		Mean = 7.89 Std. Deviation = 2.41		

TABLE IV-3

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT
FOR CHEMISTRY, PHYSICS, & PHYSICAL SCIENCE MAJORS N= 5838 (19.1%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15					1.7	98.3-99.9	0.1	99.8-99.9					15
14	0.0	99.9	0.6	99.3-99.9	3.7	96-98.2	0.8	99.1-99.8	0.0	99.8-99.9	0.1	99.8-99.9	14
13	0.1	99.8-99.9	5.7	93.7-99.3	5.6	90-95	4.4	96-99	0.5	99.3-99.7	1.4	98.5-99.8	13
12	4.1	96-98.8	9.8	85-93.6	8.1	82-89	6.7	89-95	4.1	96-99.2	7.3	92-98.4	12
11	9.2	87-95	13.9	71-84	10.5	71-81	13.6	75-88	7.7	88-95	14.1	78-91	11
10	13.0	74-86	15.6	55-70	11.7	60-70	13.3	62-74	19.7	69-87	18.7	60-77	10
9	14.8	59-73	15.3	40-54	17.9	41-59	17.8	44-61	14.9	54-68	17.7	42-59	9
8	14.3	44-58	12.6	27-39	12.9	29-40	12.3	32-43	21.0	33-53	13.8	28-41	8
7	13.7	31-43	10.4	17-26	10.3	19-28	10.4	22-31	13.7	19-32	9.9	18-27	7
6	13.1	18-30	7.4	10-16	8.3	10-18	10.0	12-21	5.7	13-18	6.3	12-17	6
5	7.7	10-17	4.3	5-9	5.5	3.8-9	5.0	7-11	5.4	8-12	5.1	7-11	5
4	4.5	4.5-9	2.6	1.8-4	2.9	0.9-3.7	3.4	2.2-6	2.3	4.8-7	2.7	4-6	4
3	2.7	1.8-4.4	1.2	0.6-1.7	0.7	0.2-0.8	1.4	0.8-2.1	2.1	2.7-4.7	1.5	1.6-3	3
2	1.2	0.6-1.7	0.4	0.2-0.5	0.1	0.0-0.1	0.6	0.2-0.7	0.8	1.9-2.6	0.8	0.8-1.5	2
1	0.5	0.0-0.5	0.1	0.0-0.1	0.0	0.0	0.1	0.0-0.1	1.8	0.0-1.8	0.7	0.0-0.7	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 7.86 Std. Deviation = 2.40		Mean = 9.02 Std. Deviation = 2.41		Mean = 9.08 Std. Deviation = 2.58		Mean = 8.70 Std. Deviation = 2.44		Mean = 8.17 Std. Deviation = 2.29		Mean = 8.69 Std. Deviation = 2.33		

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TABLE IV-4

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT FOR HUMANITIES MAJORS N= 710 (2.3%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15					0.6	99.4-99.9	0.0	99.99					15
14					0.8	98.6-99.3	0.4	99.6-99.9					14
13	0.8	99.2-99.9	3.4	96.6-99.9	2.7	96-98.5	3.5	96.1-99.5	0.7	99.3-99.9	0.7	99.3-99.9	13
12	3.9	95-99.1	6.3	90.3-96.5	4.4	92-95	3.2	93-96	6.6	93.1-99.2	6.6	93.1-99.2	12
11	9.7	86-94	8.7	83-90	7.5	85-91	10.8	83-92	12.0	82-93	12.7	81-93	11
10	15.2	71-85	11.7	71-82	9.3	76-84	8.2	75-82	24.8	57-81	15.8	65-80	10
9	15.4	56-70	14.1	57-70	17.7	58-75	18.7	56-74	18.3	39-56	17.6	48-64	9
8	15.2	41-55	15.5	41-56	14.2	44-57	13.2	43-55	15.5	23-38	16.2	31-47	8
7	11.3	29-40	14.2	27-40	12.8	31-43	14.4	28-42	11.8	11-22	9.9	22-30	7
6	13.5	16-28	11.4	16-26	14.6	16-30	11.0	17-27	3.2	8-10	6.8	15-21	6
5	6.2	10-15	6.6	9-15	8.7	8-15	8.0	9-16	2.1	6-7	6.9	8-14	5
4	4.8	5-9	4.8	4-8	4.8	3-7	4.8	5-8	1.3	3.7-5	3.5	5-7	4
3	2.4	1.6-4	2.5	.8-3	1.5	.4-2	2.4	1.4-4	1.1	2.6-3.6	1.7	1.8-4	3
2	1.1	.5-1.5	0.6	.2-.7	0.3	0-0.3	1.3	0.0-1.3	0.8	1.8-2.5	0.7	1.1-1.7	2
1	0.4	0-0.4	0.1	0-0.1					1.7	0.0-1.7	1.0	0-1	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 7.97 Std. Deviation = 2.38		Mean = 8.13 Std. Deviation = 2.47		Mean = 8.02 Std. Deviation = 2.43		Mean = 8.02 Std. Deviation = 2.48		Mean = 8.82 Std. Deviation = 2.21		Mean = 8.39 Std. Deviation = 2.40		

TABLE IV-5

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT
FOR MATH & STATISTICS MAJORS N= 333 (1%)

APRIL 1977

Scaled Score	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		Scaled Score
	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	
15					1.8	98.2-99.9	0.3	99.7-99.9					15
14	0.3	99.7-99.9	0.6	99.4-99.9	4.2	94-98.1	0.6	99.1-99.6					14
13	1.5	98.3-99.6	2.7	96.7-99.3	4.2	91-93	3.3	97-99	0.6	99.4-99.9	2.7	97.3-99.9	13
12	3.6	96-98.2	6.9	91-96.6	11.7	79-90	5.4	91-96	5.1	94.3-99.4	12.9	85-97	12
11	9.0	87-95	10.8	80-90	11.1	68-78	15.0	76-90	7.8	87-94	12.0	71-84	11
10	12.6	74-86	13.8	66-79	12.0	56-67	12.0	64-75	20.4	67-86	16.2	57-72	10
9	13.5	60-73	14.1	52-65	16.2	40-55	16.5	48-63	16.8	50-66	18.0	39-56	9
8	12.3	48-59	13.8	38-51	12.0	28-39	11.1	37-47	18.9	31-49	13.5	26-38	8
7	15.9	32-47	14.1	24-37	9.3	18-27	10.5	26-36	13.8	18-30	9.3	16-25	7
6	12.0	20-31	9.3	15-23	9.3	9-17	10.8	15-25	4.8	13-17	6.6	10-15	6
5	8.7	12-19	6.6	8-14	5.1	4-8	8.4	7-14	4.8	8-12	3.9	6-9	5
4	5.4	6-11	4.5	4-7	2.4	1-3	2.7	4-6	2.7	5-7	1.8	4-5	4
3	4.2	.91-5	2.1	.7-3	0.6	0-0.6	2.7	0.7-3.3	2.1	2.2-4.2	1.5	1.6-3	3
2	0.9	0.01-.9	0.3	.4-.6	0.0	0.0	0.3	.4-0.6	0.6	1.6-2.1	0.9	.7-1.5	2
1	0.0	0.0	0.3	0-0.3	0.0	0.0	0.3	0.0-0.3	1.5	0.0-1.5	0.6	0.0-0.6	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 7.75 Std. Deviation = 2.47		Mean = 8.34 Std. Deviation = 2.48		Mean = 9.23 Std. Deviation = 2.63		Mean = 8.44 Std. Deviation = 2.55		Mean = 8.31 Std. Deviation = 2.29		Mean = 8.93 Std. Deviation = 2.40		

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TABLE IV-6

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT
FOR PREMEDICAL MAJORS N= 1408 (4.6%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15					0.1	99.8-99.9	0.0	99.99					15
14					1.0	98.9-99.7	0.2	99.8-99.9					14
13	0.9	99.1-99.9	1.6	98.4-99.9	1.3	97.5-98.8	1.5	98.3-99.7	0.2	99.8-99.9	0.6	99.4-99.9	13
12	2.6	96.4-99	3.1	95.1-98.3	3.9	94.1-97	2.9	95.4-98.3	2.5	97.3-99.7	2.6	97.1-99.3	12
11	7.5	90-96	6.3	90-95	5.0	90-94	8.0	88-95	5.1	93-97	8.4	89-97	11
10	11.6	78-89	8.2	82-89	8.1	81-89	8.6	80-87	17.0	76-92	14.1	75-88	10
9	14.3	64-77	12.5	69-81	13.1	68-80	13.4	66-79	14.3	62-75	14.3	61-74	9
8	14.3	50-63	13.3	56-68	14.8	54-67	12.0	54-65	19.7	42-61	13.8	47-60	8
7	12.7	37-49	14.5	42-55	15.9	38-53	14.0	40-53	14.0	28-41	11.5	36-46	7
6	13.7	23-36	13.3	28-41	13.8	24-37	15.5	25-39	7.5	21-27	9.7	26-35	6
5	8.2	15-22	10.9	17-27	11.1	13-23	8.2	17-24	7.8	13-20	9.9	16-25	5
4	6.2	9-14	8.9	9-16	8.6	4-12	8.9	8-16	3.1	10-12	5.3	11-15	4
3	4.6	4-8	5.3	3-8	2.8	.5-3	4.4	2.5-7	3.2	5.5-9	3.6	7-10	3
2	2.7	.7-3.3	2.1	.2-2.2	0.3	.2-.4	2.3	.2-2.4	1.9	3.7-5.4	3.5	2.8-6	2
1	0.6	.0-0.6	0.1	.0-0.1	0.1	.0-0.1	0.1	.0-0.1	3.6	0.0-3.6	2.7	0.0-2.7	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 7.42 Std. Deviation = 2.54		Mean = 7.18 Std. Deviation = 2.54		Mean = 7.46 Std. Deviation = 2.44		Mean = 7.33 Std. Deviation = 2.57		Mean = 7.58 Std. Deviation = 2.54		Mean = 7.42 Std. Deviation = 2.73		

TABLE IV-7

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT FOR SOCIAL SCIENCES MAJORS N= 1848 (6.4%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15					0.3	99.7-99.9	0.1	99.8-99.9					15
14	0.1	99.8-99.9	0.1	99.8-99.9	0.8	98.9-99.6	0.2	99.6-99.7	0.1	99.8-99.9	0.0	99.99	14
13	0.6	99.3-99.7	1.2	98.6-99.7	2.3	96.6-98.8	1.4	98.3-99.5	0.5	99.4-99.7	1.4	98.6-99.9	13
12	3.4	96.1-99.2	3.3	95.1-98.5	3.4	93.1-96.5	3.5	95.1-98.2	5.6	93.8-99.3	3.9	94.7-98.5	12
11	8.4	89-96	8.0	88-95	6.5	88-93	8.2	88-95	8.5	86-93	10.2	86-94.6	11
10	11.9	77-88	11.3	77-87	7.6	80-87	8.8	79-87	21.6	65-85	14.8	71-85	10
9	15.0	62-76	13.7	63-76	15.7	64-79	16.6	62-78	15.2	50-64	16.1	55-70	9
8	13.0	49-61	14.9	49-62	14.1	50-63	12.3	50-61	19.4	30-49	14.6	40-54	8
7	11.7	37-48	13.7	35-48	14.3	36-49	11.9	38-49	12.2	18-29	12.4	28-39	7
6	15.2	22-36	11.7	23-34	14.0	22-35	14.4	24-37	6.0	12-17	9.6	18-27	6
5	8.9	13-21	10.0	13-22	11.1	11-21	8.9	15-23	5.7	6-11	7.9	10-17	5
4	6.5	6-12	6.1	7-12	8.1	3-10	8.9	6-14	1.9	3.5-5	3.8	6-9	4
3	3.0	2.2-5	3.2	2.8-6	1.3	.5-2	3.1	1.8-5	1.4	2.1-3.4	2.0	3.5-5	3
2	1.2	1-2.1	2.3	.5-2.7	0.2	.3-.4	1.5	.4-1.7	0.6	1.5-2	2.0	1.5-3.4	2
1	0.9	0-0.9	0.4	0-.4	0.2	0-.2	0.3	0-.3	1.4	0.0-1.4	1.4	0.0-1.4	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 7.57 Std. Deviation = 2.48		Mean = 7.56 Std. Deviation = 2.51		Mean = 7.65 Std. Deviation = 2.44		Mean = 7.52 Std. Deviation = 2.53		Mean = 8.40 Std. Deviation = 2.26		Mean = 7.96 Std. Deviation = 2.52		

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TABLE IV-8

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT
FOR SOPHOMORES N= 1554 (5.1%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15					0.9	99.1-99.9	0.0	99.9					15
14	0.0	99.9	0.2	99.8-99.9	2.4	96.7-99.0	0.3	99.7-99.9					14
13	0.6	99.4-99.9	3.2	96.6-99.7	3.5	94-96.6	2.6	98-99.6	0.4	99.6-99.9	0.9	99.1-99.9	13
12	3.3	97-99.3	6.4	91-96.5	7.1	87-93	4.3	94-97	3.3	96.3-99.5	5.4	93.7-99.0	12
11	8.6	88-96	11.8	79-90	8.0	79-86	11.5	82-93	7.3	90-96.2	12.0	83-93.6	11
10	13.8	75-87	14.9	64-78	11.0	68-78	13.9	68-81	18.6	71-89	17.8	65-82	10
9	14.9	60-74	16.0	48-63	17.4	51-67	16.7	52-67	14.9	56-70	18.7	46-64	9
8	14.4	45-59	14.4	34-47	15.2	35-50	13.7	38-51	21.3	35-55	14.9	31-45	8
7	13.9	31-44	12.7	21-33	12.8	23-34	11.9	26-37	14.1	21-34	11.5	20-30	7
6	14.4	17-30	8.7	13-20	10.7	12-22	12.2	14-25	6.9	14-20	7.2	13-19	6
5	6.9	10-16	6.0	7-12	6.4	6-11	6.4	7-13	5.9	8-13	5.1	7-12	5
4	5.2	5-9	2.9	2.8-6	3.5	1.1-5	3.8	2.7-6	2.4	4.9-7	3.7	2.8-6	4
3	2.2	1.8-4	2.1	0.7-2.7	1.0	0.0-1.0	2.0	0.7-2.6	2.8	2.1-4.8	1.4	1.4-2.7	3
2	1.2	0.6-1.7	0.6	0.0-0.6	0.0	0.0	0.6	0.0-0.6	0.7	1.4-2	0.7	0.7-1.3	2
1	0.5	0.0-0.5			0.0	0.0	0.0	0.0	1.3	0.0-1.3	0.6	0.0-0.6	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 7.79 Std. Deviation = 2.36		Mean = 8.50 Std. Deviation = 2.40		Mean = 8.57 Std. Deviation = 2.52		Mean = 8.27 Std. Deviation = 2.40		Mean = 8.07 Std. Deviation = 2.25		Mean =8.45 Std. Deviation =2.29		

TABLE IV-9

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT
FOR JUNIORS N = 17428 (57%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15			0.0	99.9	0.7	99.3-99.9	0.0						15
14	0.0	99.9	0.2	99.8-99.9	1.7	97.6-99.2	0.5	99.5-99.9	0.0	99.9	0.0	99.9	14
13	1.1	98.9-99.9	3.4	96.4-99.7	3.3	94.3-97.5	2.9	96.6-99.4	0.4	99.6-99.9	1.1	98.9-99.9	13
12	4.8	94.1-98.8	6.6	91-96.3	5.4	90-94.2	5.3	92-96.5	4.0	97-99.5	5.0	93.9-98.8	12
11	10.0	85-94	10.9	80-90	7.8	82-89	11.7	81-91	7.6	89-96	11.1	84-93.8	11
10	14.8	70-84	13.2	67-79	10.0	72-81	11.7	69-80	19.5	69-88	16.1	68-83	10
9	16.0	54-69	14.6	52-66	17.2	55-71	17.3	52-68	15.1	54-68	16.9	51-67	9
8	14.2	40-53	13.4	39-51	14.3	41-54	12.9	39-51	20.0	34-53	14.5	36-50	8
7	12.1	28-39	12.5	26-38	13.4	27-40	11.5	27-38	14.1	20-33	11.7	25-35	7
6	12.7	15-27	10.3	16-25	12.0	15-26	11.9	15-26	6.1	14-19	8.5	16-24	6
5	6.4	9-14	7.2	9-15	8.4	7-14	6.4	9-14	6.0	8-13	7.3	9-15	5
4	4.1	5-8	4.7	3-8	4.8	1-6	5.3	2.6-8	2.4	4.8-7	3.3	5-8	4
3	2.3	1.5-4	2.1	0.9-2.9	0.8	0.2-0.9	1.7	0.9-2.5	2.2	2.6-4.7	2.0	2.5-4	3
2	1.0	0.5-1.4	0.7	0.2-0.8	0.1	0.0-0.1	0.7	0.2-0.8	0.9	1.7-2.5	1.5	1.0-2.4	2
1	0.4	0.0-0.4	0.1	0.0-0.1	0.0	0.0	0.1	0.0-0.1	1.6	0.0-1.6	0.9	0.0-0.9	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 8.08 Std. Deviation = 2.38		Mean = 8.30 Std. Deviation = 2.51		Mean = 8.27 Std. Deviation = 2.51		Mean = 8.25 Std. Deviation = 2.51		Mean = 8.13 Std. Deviation = 2.24		Mean = 8.19 Std. Deviation = 2.51		

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TABLE IV-10

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT
FOR SENIORS N= 5788 (18.9%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15					0.6	99.4-99.9	0.1	99.9					15
14	0.1	99.9	0.2	99.8-99.9	1.1	98.3-99.3	0.3	99.6-99.8	0.0	99.9			14
13	0.9	99.0-99.8	1.6	98.2-99.7	1.7	96.6-98.2	1.9	97.7-99.5	0.2	99.8-99.9	0.9	99.1-99.9	13
12	3.9	95.1-98.9	4.1	94.1-98.1	3.0	94-96.5	3.6	94-97.6	3.1	96.7-99.7	3.8	95.3-99	12
11	8.4	88-95	6.8	88-94	5.3	89-93	8.2	87-94	6.7	91-96.6	9.0	87-95.2	11
10	12.8	75-87	10.6	78-87	7.6	82-88	10.1	77-86	16.9	74-90	13.2	74-86	10
9	15.7	59-74	12.5	65-77	13.8	68-81	15.4	61-76	14.2	60-73	14.8	59-73	9
8	14.6	45-58	14.6	51-64	14.1	54-67	13.4	48-60	19.7	40-59	15.3	44-58	8
7	12.5	32-44	14.5	36-50	15.8	38-53	13.3	35-47	13.9	26-39	12.1	32-43	7
6	13.2	19-31	12.6	23-35	15.3	23-37	13.2	21-34	7.2	19-25	9.7	22-31	6
5	7.6	11-18	10.0	13-22	12.2	10-22	8.5	13-20	7.2	12-18	8.7	13-21	5
4	5.1	5.2-10	6.7	5.8-12	7.7	1.8-9	7.4	4.6-12	2.9	9-11	4.6	7.9-12	4
3	3.3	1.9-5.1	3.6	2.2-5.7	1.5	0.3-1.7	3.1	1.5-4.5	3.0	5-8	3.0	4.9-7.8	3
2	1.3	0.6-1.8	2.0	0.2-2.1	0.2	0.0-0.2	1.3	0.2-1.4	1.4	3.6-4.9	2.9	2.0-4.8	2
1	0.5	0.0-0.5	0.1	0.0-0.1	0.0	0.0	0.1	0.0-0.1	3.5	0.0-3.5	1.9	0.0-1.9	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 7.76 Std. Deviation = 2.43		Mean = 7.54 Std. Deviation = 2.51		Mean = 7.53 Std. Deviation = 2.43		Mean = 7.67 Std. Deviation = 2.51		Mean = 7.72 Std. Deviation = 2.51		Mean = 7.66 Std. Deviation = 2.66		

TABLE IV-11

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT
FOR GRADUATES N= 5604 (18.3%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15			0.0	99.9	0.6	99.4-99.9	0.0	99.9					15
14	0.1	99.9	0.2	99.8-99.9	1.6	97.8-99.3	0.4	99.6-99.9	0.0	99.9	0.0	99.9	14
13	1.0	98.8-99.8	2.2	97.6-99.7	1.8	96-97.7	2.3	97.3-99.5	0.4	99.6-99.9	1.0	99-99.9	13
12	4.1	94.8-98.8	4.0	93.6-97.5	3.2	92.8-95.9	3.4	95-97.2	4.4	96-99.5	4.2	96-98.9	12
11	9.8	86-94.7	6.8	88-93.5	4.9	89-92.7	8.4	86-94	7.8	88-95	9.8	86-95	11
10	13.2	73-85	10.1	78-87	7.5	81-88	9.6	77-85	18.2	70-87	14.3	72-85	10
9	14.4	58-72	12.7	65-77	13.4	68-80	16.2	61-76	14.4	56-69	15.2	56-71	9
8	13.0	45-57	13.7	51-64	13.7	54-67	11.9	49-60	18.9	37-55	14.5	42-55	8
7	12.5	33-44	13.0	38-50	15.1	39-53	12.2	37-48	13.2	24-36	11.5	30-41	7
6	13.0	20-32	12.8	25-37	14.5	25-38	13.6	23-36	5.9	18-23	9.0	21-29	6
5	7.4	12-19	9.4	16-24	11.9	13-24	8.9	14-22	6.3	11-17	8.4	13-20	5
4	5.5	6.0-11	7.9	8-15	9.4	2.4-12	7.5	5.6-13	3.1	7.4-10	4.7	7.4-12	4
3	3.2	2.8-5.9	4.9	2.3-7	1.9	0.5-2.3	3.7	1.9-5.5	2.7	4.7-7.3	3.0	4.4-7.3	3
2	1.8	1.0-2.7	2.0	0.3-2.2	0.4	0.0-0.4	1.7	0.2-1.8	1.1	3.6-4.6	1.9	2.5-4.3	2
1	0.9	0.0-0.9	0.2	0.0-0.2	0.0	0.0	0.1	0.0-0.1	3.5	0.0-3.5	2.4	0.0-2.4	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 7.77 Std. Deviation = 2.55		Mean = 7.45 Std. Deviation = 2.62		Mean = 7.50 Std. Deviation = 2.55		Mean = 7.63 Std. Deviation = 2.62		Mean = 7.93 Std. Deviation = 2.55		Mean = 7.79 Std. Deviation = 2.69		

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TABLE IV-12

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT
FOR BLACK EXAMINEES N= 1704 (5.6%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15													15
14					0.1	99.9	0.0	99.9					14
13	0.1	99.9	0.0	99.9	0.2	99.7-99.8	0.1	99.9	0.1	99.9	0.0	99.9	13
12	0.1	99.8-99.9	0.3	99.7-99.9	0.4	99.3-99.6	0.2	99.7-99.8	0.2	99.7-99.8	0.1	99.9	12
11	0.7	99.1-99.7	1.1	98.6-99.6	0.4	98.9-99.2	0.8	98.9-99.6	0.9	98.8-99.6	1.1	98.8-99.8	11
10	2.5	96.6-99.0	2.0	96.6-98.5	1.3	97.6-98.8	1.8	97.1-98.8	4.0	94.8-98.7	1.7	97.1-98.7	10
9	4.7	93-96.5	4.5	93-96.5	3.1	94.5-97.5	3.5	93.6-97.0	5.0	91-94.7	4.0	94-97	9
8	6.5	86-92	6.5	87-92	5.5	90-94.4	5.9	89-93.5	11.7	79-90	6.1	88-93	8
7	10.5	76-85	11.0	76-86	11.4	79-89	8.6	80-88	14.3	65-78	8.7	79-87	7
6	18.4	57-75	16.0	60-75	18.0	51-78	15.6	64-79	10.2	55-64	10.4	69-78	6
5	17.5	40-56	18.5	41-59	26.2	34-60	18.5	46-63	14.3	40-54	19.0	50-68	5
4	15.7	24-39	18.4	23-40	25.6	9-33	23.6	22-45	9.3	31-39	14.1	36-49	4
3	12.7	12-23	14.7	7-22	6.3	1.5-8	13.8	9-21	10.2	21-30	12.2	24-35	3
2	6.6	4.0-11	6.3	0.7-6.9	1.2	0.3-1.4	6.6	1.0-8	6.1	14-20	12.1	10.5-23	2
1	3.9	0.0-3.9	0.6	0.0-0.6	0.2	0.0-0.2	0.9	0.0-0.9	13.6	0.0-13.6	10.4	0-10.4	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 5.19 Std. Deviation = 2.19		Mean = 5.25 Std. Deviation = 2.08		Mean = 5.41 Std. Deviation = 1.72		Mean =5.06 Std. Deviation =2.00		Mean = 5.18 Std. Deviation = 2.68		Mean =4.61 Std. Deviation =2.39		

TABLE IV-13

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT
FOR WHITE EXAMINEES N= 25902 (84.7%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15	0.0	99.9	0.0	99.9	0.7	99.3-99.9	0.1	99.9					15
14	0.1	99.9	0.3	99.7-99.9	1.8	97.5-99.2	0.5	99.4-99.8	0.0	99.9	0.0	99.9	14
13	1.2	98.7-99.8	3.1	96.6-99.6	3.0	94.5-97.4	2.8	96.6-99.3	0.4	99.5-99.8	1.1	98.9-99.9	13
12	4.9	93.8-98.6	6.1	91-96.5	5.0	90-94.4	5.0	93-96.5	4.4	96-99.4	5.1	95-98.8	12
11	10.5	84-93.7	10.2	81-90	7.4	83-89	11.4	81-92	8.3	88-95	11.7	83-94	11
10	15.2	69-83	13.2	68-80	9.8	73-82	12.0	69-80	20.6	67-87	16.9	66-82	10
9	16.8	52-68	14.7	53-67	17.1	56-72	18.1	51-68	16.0	51-66	17.5	49-65	9
8	14.8	37-51	14.4	39-52	15.0	41-55	13.6	37-50	20.8	30-50	15.5	33-48	8
7	12.5	25-36	13.4	26-38	14.5	27-40	12.3	25-36	13.7	17-29	11.9	21-32	7
6	12.4	13-24	10.6	15-25	12.5	14-26	12.1	13-24	5.8	11-16	8.4	13-20	6
5	5.7	7-12	7.1	8-14	8.2	6-13	6.1	7-12	5.3	5-10	6.6	6-12	5
4	3.4	3-6	4.3	3-7	4.2	0.8-5	4.3	1.7-6	1.9	2.7-4.5	2.8	2.5-5	4
3	1.6	0.9-2.4	1.8	0.8-2.5	0.6	0.2-0.7	1.2	0.5-1.6	1.5	1.2-2.6	1.3	1.2-2.4	3
2	0.6	0.3-0.8	0.6	0.2-0.7	0.1	0.0-0.1	0.4	0.0-0.4	0.4	0.8-1.1	0.7	0.5-1.1	2
1	0.2	0.0-0.2	0.1	0.0-0.1	0.0	0.0	0.0	0.0	0.7	0.0-0.7	0.4	0.0-0.4	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 8.24 Std. Deviation = 2.27		Mean = 8.27 Std. Deviation = 2.44		Mean = 8.25 Std. Deviation = 2.43		Mean = 8.32 Std. Deviation = 2.37		Mean = 8.38 Std. Deviation = 2.11		Mean = 8.40 Std. Deviation = 2.26		

TABLE IV-14

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT
FOR AMERICAN INDIAN-ALASKAN NATIVE EXAMINEES N= 99 (.3%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15													15
14					1.0	99.1-99.9	0.0						14
13	0.0		1.0	99.0-99.9	2.0	97.0-99.0	0.0						13
12	2.0	98-99.9	2.0	97.0-98.9	0.0	97.0-99.0	1.0	98.9-99.9	2.0	98.0-99.9	1.0	99.0-99.9	12
11	3.0	95.1-97.9	3.0	94.1-96.9	2.0	95.0-96.9	4.0	94.9-98.8	7.1	92-97.9	4.0	95.0-98.9	11
10	10.1	86-95	5.1	90-94	6.1	90-94.9	7.1	89-94.8	10.0	82-91	9.1	87-94.9	10
9	13.1	73-85	11.1	79-89	7.1	83-89	9.1	80-88	15.2	67-81	10.1	77-86	9
8	10.1	63-72	11.1	68-78	14.1	69-82	14.1	66-79	16.1	50-66	17.2	60-76	8
7	13.1	50-62	17.2	50-67	19.2	49-68	14.1	51-65	25.2	25-49	15.2	44-59	7
6	18.2	31-49	18.1	32-49	17.1	32-48	21.2	30-50	9.1	16-24	16.1	28-43	6
5	12.1	19-30	16.1	16-31	17.2	15-31	10.1	20-29	6.1	10-15	10.1	18-27	5
4	9.1	9.2-18	9.1	6.2-15	11.1	4-14	14.1	6-19	1.0	8.1-9	10.1	8-17	4
3	7.1	3-9.1	6.1	0.0-6.1	3.0	0.0-3	2.0	3.1-5	3.0	5.1-8.0	4.0	4-7	3
2	2.0	0.0-2	0.0	0.0	0.0	0.0	3.0	0-3.0	2.0	3.1-5.0	3.0	0.0-3	2
1									3.0	0-3.0	0.0	0.0	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 6.81 Std. Deviation = 2.37		Mean = 6.75 Std. Deviation = 2.22		Mean = 6.77 Std. Deviation = 2.19		Mean = 6.68 Std. Deviation = 2.21		Mean = 7.51 Std. Deviation = 2.36		Mean = 6.88 Std. Deviation = 2.27		

TABLE IV-15

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT
FOR ASIAN OR PACIFIC ISLANDER EXAMINEES N= 1432 (4.7%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15					0.9	99.1-99.9	0.0						15
14					1.5	97.6-99.0	0.4	99.6-99.9					14
13	0.6	99.4-99.9	2.8	97.2-99.9	4.3	94-97.5	3.1	96.5-99.5	0.1	99.9	0.8	99.2-99.9	13
12	3.9	95.5-99.3	6.8	90.4-97.1	5.7	89-93	5.3	92-96.4	1.3	98.6-99.8	4.4	94.8-99.1	12
11	8.2	88-95.4	11.2	80-90.3	7.8	81-88	10.4	82-91	5.0	95-98.5	7.6	88-94.7	11
10	14.7	74-87	13.5	67-79	10.2	71-80	11.7	70-81	12.3	82-94	12.4	76-87	10
9	13.5	60-73	14.8	52-66	16.1	54-70	14.8	55-69	10.2	72-81	14.4	61-75	9
8	13.2	47-59	13.3	39-51	14.2	40-53	13.1	42-54	17.3	55-71	15.0	46-60	8
7	13.2	34-46	11.4	27-38	12.4	28-39	11.9	30-41	16.5	38-54	13.2	33-45	7
6	12.8	21-33	10.0	17-26	11.5	16-27	11.8	18-29	8.4	30-37	10.7	22-32	6
5	8.6	12-20	7.4	10-16	8.3	8-15	7.6	11-17	9.6	20-29	8.7	14-21	5
4	5.7	6-11	4.9	4-9	6.1	1.0-7	6.1	3.8-10	5.2	15-19	5.0	7.8-13	4
3	3.1	2.5-5.5	2.7	1.2-3.8	0.8	0.2-0.9	2.7	1.1-3.7	4.9	10-14	3.3	4.5-7.7	3
2	1.7	0.8-2.4	1.0	0.2-1.1	0.1	0.0-0.1	0.9	0.2-1.0	3.2	6-9	2.9	1.6-4.4	2
1	0.7	0.0-0.7	0.1	0.0-0.1	0.0	0.0	0.1	0.0-0.1	5.9	0-5.9	1.5	0.0-1.5	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 7.67 Std. Deviation = 2.49		Mean = 8.23 Std. Deviation = 2.56		Mean = 8.30 Std. Deviation = 2.59		Mean = 8.06 Std. Deviation = 2.57		Mean = 6.88 Std. Deviation = 2.74		Mean =7.58 Std. Deviation =2.61		

TABLE IV-16

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT
FOR HISPANIC-MEXICAN AMERICAN OR CHICANO EXAMINEES N= 331 (1.1%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15					0.3	99.6-99.9	0.0	99.9					15
14					0.0	99.6-99.9	0.0	99.9					14
13	0.3	99.6-99.9	0.6	99.4-99.9	0.3	99.3-99.5	0.6	99.4-99.9	0.0		0.3	99.7-99.9	13
12	1.5	98.1-99.5	0.9	98.5-99.3	2.1	97.2-99.2	0.6	98.8-99.3	0.6	99.3-99.8	1.5	98.2-99.6	12
11	2.7	95.4-98.0	3.9	94.6-98.4	1.2	96.0-97.1	3.0	95.8-98.7	2.1	97.2-99.2	2.1	96.1-98.1	11
10	6.9	90-95.3	5.4	90-94.5	3.9	93-95.9	3.9	91.9-95.7	11.5	87-97.1	7.3	90-96	10
9	6.3	83-89	8.8	81-89	6.6	86-92	9.1	84-91.8	6.9	80-86	8.8	81-89	9
8	13.0	70-82	10.6	71-80	10.6	76-85	11.2	73-83	19.6	60-79	11.8	69-80	8
7	12.4	58-69	17.5	53-70	17.2	59-75	12.7	60-72	15.4	45-59	12.1	57-68	7
6	26.0	32-57	15.1	38-52	19.9	39-58	19.9	40-59	12.1	33-44	16.3	41-56	6
5	15.7	16-31	14.8	23-37	19.6	19-38	15.4	25-39	13.6	19-32	14.7	26-40	5
4	6.6	10-15	13.3	10-22	15.7	2.5-18	14.8	8.8-24	6.3	13-18	11.2	15-25	4
3	4.2	4.3-9	6.6	2.5-9	2.1	0.4-2.4	6.9	1.9-8.7	6.3	5.5-12	6.6	8-14	3
2	3.3	1.0-4.2	2.1	0.4-2.4	0.3	0.0-0.3	1.8	0.0-1.8	0.9	4.6-5.4	3.0	4.3-7	2
1	0.9	0.0-0.9	0.3	0.0-0.3					4.5	0.0-4.5	4.2	0.0-4.2	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 6.50 Std. Deviation = 2.24		Mean = 6.45 Std. Deviation = 2.31		Mean = 6.39 Std. Deviation = 2.05		Mean = 6.28 Std. Deviation = 2.21		Mean = 6.64 Std. Deviation = 2.44		Mean = 6.22 Std. Deviation = 2.54		

TABLE IV-17

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT
FOR HISPANIC-PUERTO RICAN (MAINLAND) EXAMINEES N= 127 (.4%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15													15
14									0.8	99.1-99.9	0.0	99.9	14
13									0.0	99.1-99.9	0.0	99.9	13
12	0.8	99.2-99.9	0.8	99.2-99.9	0.8	99.2-99.9	0.0	99.9	1.6	97.5-99.0	0.0	99.9	12
11	0.8	98.4-99.1	3.1	96.1-99.1	0.0	99.2-99.9	3.1	96.8-99.8	2.4	95.1-97.4	3.1	96.9-99.9	11
10	2.4	96.0-98.3	7.9	89-96	5.5	93.7-99.1	3.9	94-96.7	3.9	92-95	2.4	94.5-96.8	10
9	3.9	93-95.9	3.9	85-88	9.4	85-93.6	6.3	88-93	3.1	89-91	8.7	87-94.4	9
8	16.4	77-92	7.1	78-84	8.7	77-84	10.2	77-87	16.5	73-88	8.7	78-86	8
7	15.0	62-76	8.7	69-77	14.2	62-76	9.4	68-76	15.7	57-72	11.7	66-77	7
6	14.2	47-61	18.1	51-68	13.4	49-61	19.7	48-67	10.2	47-56	11.0	55-65	6
5	16.5	31-46	15.0	36-50	18.8	30-48	15.7	33-47	12.6	34-46	12.6	43-54	5
4	11.0	20-30	16.4	20-35	22.0	8-29	16.5	16-32	5.5	29-33	11.0	32-42	4
3	7.9	12-19	12.6	6.4-19	6.3	0.9-7	11.8	3.3-15	6.3	22-28	13.3	18-31	3
2	7.9	3.2-11	6.3	0.0-6.3	0.8	0.0-0.8	2.4	0.9-3.2	4.7	16.6-21	8.7	8.8-17	2
1	3.1	0.0-3.1	0.0	0.0	0.0	0.0	0.8	0.0-0.8	16.5	0.0-16.5	8.7	0.0-8.7	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 5.69 Std. Deviation = 2.30		Mean = 5.76 Std. Deviation = 2.44		Mean = 6.02 Std. Deviation = 2.07		Mean = 5.83 Std. Deviation = 2.22		Mean = 5.57 Std. Deviation = 3.00		Mean = 5.28 Std. Deviation = 2.68		

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TABLE IV-18

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT FOR HISPANIC-PUERTO RICAN (COMMONWEALTH) EXAMINEES N= 334 (1.1%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15													15
14													14
13	0.0	99.9	0.6	99.4-99.9	0.3	99.7-99.9	0.3	99.7-99.9			0.3	99.7-99.9	13
12	0.0	99.9	0.0	99.4-99.9	0.3	99.4-99.6	0.0	99.7-99.9	0.6	99.4-99.9	0.0	99.7-99.9	12
11	1.5	98.5-99.9	0.9	98.5-99.3	0.3	99.1-99.3	0.6	99.1-99.6	0.3	99.1-99.3	0.0	99.7-99.9	11
10	1.2	97.3-98.4	1.5	97.0-98.4	0.6	98.5-99.0	0.3	98.8-99.0	1.8	97.3-99.0	1.8	97.9-99.6	10
9	2.7	94.6-97.2	1.2	95.8-96.9	2.1	96.4-98.4	3.0	95.8-98.7	1.8	95.5-97.2	2.1	95.8-97.8	9
8	2.1	92.5-94.5	3.0	92.8-95.7	3.0	93.4-96.3	2.1	93.7-95.7	2.1	93.4-95.4	2.7	93.1-95.7	8
7	5.7	88-92.4	5.1	89-92.7	6.6	88-93.3	3.9	89.8-93.6	6.9	87-93.3	3.9	90-93	7
6	14.1	74-87	12.3	76-88	12.0	76-87	11.4	79-89.7	6.0	81-86	5.7	84-89	6
5	16.4	57-73	16.4	60-75	24.5	51-75	16.8	63-78	11.1	70-80	11.1	73-83	5
4	21.0	36-56	24.2	36-59	34.6	17-50	29.2	33-62	9.9	60-69	12.8	61-72	4
3	17.3	19-35	20.6	15-35	13.8	1.9-16	21.5	12-32	15.2	45-59	15.5	45-60	3
2	13.1	4.9-18	13.2	1.0-14	1.5	0.4-1.8	9.9	1.0-11	8.1	36.2-44	24.0	21-44	2
1	4.8	0.0-4.8	0.9	0.0-0.9	0.3	0.0-0.3	0.9	0.0-0.9	36.1	0.0-36.1	20.0	0.0-20	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 4.43 Std. Deviation = 2.09		Mean = 4.45 Std. Deviation = 1.99		Mean = 4.84 Std. Deviation = 1.62		Mean = 4.39 Std. Deviation = 1.80		Mean = 3.39 Std. Deviation = 2.51		Mean = 3.45 Std. Deviation = 2.27		

TABLE IV-19

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT
FOR HISPANIC (CUBAN) EXAMINEES N= 161 (.5%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15					0.6	99.4-99.9	0.0	99.9					15
14					0.6	98.8-99.3	0.0	99.9					14
13	1.2	98.8-99.9	1.9	98.1-99.9	0.6	98.2-98.7	1.9	98.0-99.9					13
12	2.5	96.3-98.7	3.1	95.0-98.0	2.5	95.7-98.1	0.6	97.4-97.9	0.6	99.4-99.9	0.6	99.4-99.9	12
11	2.5	93.8-96.2	5.0	91-94.9	3.7	92.0-95.6	3.7	93.7-97.3	5.0	95-99.3	6.2	94-99.3	11
10	6.8	88-93.7	11.2	80-90	5.6	87-91.9	6.8	88-93.6	8.1	87-94	3.1	91-93	10
9	17.4	71-87	11.2	69-79	9.3	78-86	11.2	77-87	9.9	77-86	13.7	77-90	9
8	17.4	53-70	12.4	56-68	8.7	69-77	14.3	62-76	21.6	56-76	14.2	63-76	8
7	10.6	43-52	11.2	45-55	15.5	54-68	15.5	47-61	19.3	36-55	16.7	46-62	7
6	19.2	23-42	16.6	28-44	19.9	34-53	16.1	31-46	9.3	27-35	11.8	35-45	6
5	9.3	14-22	11.7	17-27	14.9	19-33	15.5	15-30	9.9	17-26	14.3	20-34	5
4	5.0	9-13	7.5	9-16	15.5	2.6-18	9.3	6-14	5.0	12-16	5.6	15-19	4
3	6.8	1.3-8	5.6	2.6-8	2.5	0.0-2.5	3.7	1.3-5	5.6	5.7-11	5.6	9-14	3
2	1.2	0.0-1.2	2.5	0.0-2.5	0.0	0.0	1.2	0.0-1.2	1.9	3.8-5.6	5.6	2.6-8	2
1									3.7	0.0-3.7	2.5	0.0-2.5	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 7.16 Std. Deviation = 2.31		Mean = 7.17 Std. Deviation = 2.57		Mean = 6.78 Std. Deviation = 2.38		Mean = 6.90 Std. Deviation = 2.27		Mean = 6.91 Std. Deviation = 2.43		Mean = 6.57 Std. Deviation = 2.51		

TABLE IV-20

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT
FOR HISPANIC (OTHER) EXAMINEES N= 201 (.7%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15													15
14					1.0	99.0-99.9	0.0	99.9					14
13	0.5	99.5-99.9	1.0	99.0-99.9	1.0	98.0-98.9	1.5	98.5-99.9	0.5	99.5-99.9	0.0	99.9	13
12	1.0	98.5-99.4	6.5	93-98.9	3.0	95.0-97.9	1.5	97.0-98.4	2.0	97.5-99.4	1.5	98.5-99.9	12
11	4.5	95-98.4	6.0	87-92	3.5	92-94.9	8.5	89-96.9	4.0	94-97.4	6.5	93-98.4	11
10	13.9	81-94	7.0	80-86	5.5	87-91	9.5	80-88	8.0	86-93	9.5	83-92	10
9	14.3	67-80	10.0	70-79	10.0	77-86	13.3	67-79	12.4	74-85	11.9	72-82	9
8	13.9	53-66	14.3	56-69	17.8	59-76	5.0	62-66	15.9	58-73	11.4	60-71	8
7	13.4	39-52	13.8	42-55	13.9	45-58	11.3	50-61	14.8	43-57	12.8	47-59	7
6	9.5	30-38	15.3	27-41	16.4	29-44	21.3	29-49	8.0	35-42	14.4	33-46	6
5	8.0	22-29	9.0	18-26	10.4	18-28	9.0	20-28	12.8	23-34	11.4	22-32	5
4	11.4	11-21	9.0	9-17	12.9	4.6-17	10.0	10-19	5.0	18-22	5.5	16-21	4
3	4.5	6-10	3.0	6-8	4.5	0.0-4.5	3.5	5.6-9	5.0	11.6-17	4.5	12-15	3
2	2.5	2.6-5	5.0	0.0-5	0.0	0.0	5.0	0.6-5.5	2.5	9.1-11.5	6.0	4.6-11	2
1	2.5	0.0-2.5	0.0	0.0	0.0	0.0	0.5	0.0-0.5	9.0	0.0-9.0	4.5	0.0-4.5	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 7.05 Std. Deviation = 2.61		Mean = 7.20 Std. Deviation = 2.66		Mean = 7.02 Std. Deviation = 2.38		Mean = 7.00 Std. Deviation = 2.67		Mean = 6.59 Std. Deviation = 2.86		Mean = 6.69 Std. Deviation = 2.77		

TABLE IV-21

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT
FOR MALE EXAMINEES N= 22708 (74.2%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15	0.0	99.99	0.0	99.99	0.9	99.1-99.9	0.1	99.8-99.9					15
14	0.1	99.8-99.9	0.3	99.7-99.9	2.1	97-99	0.5	99.4-99.7	0.0	99.99	0.0	99.99	14
13	1.2	98.7-99.7	3.4	96.2-99.6	3.5	95-96	3.2	96.2-99.3	0.3	99.5-99.7	1.2	98.8-99.9	13
12	4.8	95-98.6	6.7	91-96	5.8	89-94	5.4	92-96	3.5	96-99.4	5.4	94-98.7	12
11	10.5	84-94	10.5	80-90	8.2	81-88	11.8	80-91	7.1	90-95	11.8	83-93	11
10	14.8	70-83	13.0	67-79	10.2	70-80	11.9	68-79	18.4	72-89	16.5	66-82	10
9	15.9	54-69	14.3	53-66	16.8	54-69	17.1	51-67	14.8	57-71	16.8	49-65	9
8	14.0	40-53	13.3	40-52	14.1	40-53	12.7	38-50	20.0	37-56	14.5	35-48	8
7	12.2	28-39	12.4	27-39	13.1	26-39	11.4	27-37	14.3	23-36	11.1	24-34	7
6	12.2	15-27	10.3	17-26	11.4	15-25	11.4	16-26	6.6	16-22	8.1	16-23	6
5	6.3	9-14	7.3	10-16	8.0	7-14	6.4	9-15	6.6	9-15	6.8	9-15	5
4	4.2	5-8	4.9	5-9	4.9	2-6	5.2	4-8	2.7	7-8	3.3	6-8	4
3	2.3	1.7-4	2.5	1.2-4	0.9	0.2-1	2.0	1-3	2.5	4-6	2.0	2.7-5	3
2	1.1	0.6-1.6	1.0	0.2-1.1	0.1	0.00-0.1	0.8	.2-.9	1.0	2.4-3	1.4	1.3-2.6	2
1	0.5	0.0-0.5	0.1	0.0-0.1	0.0	0.0-0.00	0.1	0-.1	2.3	0.0-2.3	1.2	0.0-1.2	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 8.09 Std. Deviation = 2.42		Mean = 8.24 Std. Deviation = 2.57		Mean = 8.36 Std. Deviation = 2.55		Mean = 8.27 Std. Deviation = 2.52		Mean = 7.96 Std. Deviation = 2.38		Mean = 8.25 Std. Deviation = 2.48		

TABLE IV-22

PERCENTAGES OF NEW MCAT EXAMINEES ACHIEVING SCALED SCORE LEVELS AND ASSOCIATED PERCENTILE RANK RANGES BY AREA OF ASSESSMENT
FOR FEMALE EXAMINEES N= 7887 (25.8%)

APRIL 1977

	Biology		Chemistry		Physics		Science Problems		Skills Analysis: Reading		Skills Analysis: Quantitative		
Scaled Score	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Percent Achieving Score	Percentile Rank Range	Scaled Score
15					0.1	99.8-99.9							15
14			0.1	99.8-99.9	0.3	99.5-99.7	0.1	99.8-99.9					14
13	0.6	99.4-99.9	0.9	98.7-99.7	0.6	98.9-99.4	0.9	98.7-99.7	0.5	99.5-99.9	0.4	99.6-99.9	13
12	3.3	96.1-99.3	2.7	96.1-98	1.3	97.1-98	2.2	96.8-98.6	4.8	95-99.4	2.4	98-99.5	12
11	6.9	90-96	6.5	91-96	2.9	96-97	6.6	91-96	8.6	87-94	6.9	91-97	11
10	11.9	78-89	10.2	81-90	6.1	90-95	9.0	82-90	19.6	67-86	12.1	79-90	10
9	14.8	63-77	13.0	68-80	13.2	77-89	15.4	67-81	14.7	53-66	15.0	64-78	9
8	14.5	49-62	14.8	53-67	14.6	62-76	13.5	53-66	19.2	33-52	15.5	49-63	8
7	12.8	36-48	15.0	38-52	17.0	45-61	13.5	40-52	12.7	19-32	13.4	35-48	7
6	15.0	21-35	13.2	25-37	17.3	28-44	15.6	24-39	5.7	15-20	10.7	25-34	6
5	8.6	13-20	10.3	14-24	14.6	13-27	9.8	14-23	5.4	10-14	10.3	14-24	5
4	5.9	6-12	7.4	7-13	9.9	2.2-12	8.4	6-13	2.5	7-9	5.3	9-13	4
3	3.4	2.3-5.6	4.0	1.9-6	1.8	.4-2.1	3.5	1.7-5	2.5	3.6-6	3.4	4.7-8	3
2	1.5	.8-2.2	1.6	.3-1.8	0.3	0.0-0.3	1.4	0.3-1.6	1.1	2.5-3.5	2.8	1.9-4.6	2
1	0.7	0.0-0.7	0.2	0.0-0.2	0.0	0.0-0.0	0.2	0.0-0.2	2.4	0.0-2.4	1.8	0.0-1.8	1
	Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		Scaled Score		
	Mean = 7.52 Std. Deviation = 2.43		Mean = 7.36 Std. Deviation = 2.42		Mean = 6.98 Std. Deviation = 2.10		Mean = 7.32 Std. Deviation = 2.39		Mean = 8.15 Std. Deviation = 2.46		Mean = 7.38 Std. Deviation = 2.54		

CHAPTER 5

THE NEW MCAT IN ADMISSIONS DECISIONS

General cognitive skills in addition to knowledge in a particular discipline traditionally have been demonstrated to provide the most accurate prediction of success or failure in advanced study. Successful completion of the medical school curriculum requires a certain level of intellectual and analytical ability as well as a background in the biological and physical sciences. The New MCAT provides information of this kind in a standardized format for all examinees.

Since admissions procedures and factors influencing admissions decisions are determined at the institutional level, the role of the New MCAT scores in the admission process is strictly dependent upon locally determined policy and procedures. The AAMC functions to provide the testing mechanism and test results, and to make general suggestions regarding the appropriate interpretation of scores.

While the New MCAT is designed to evaluate the academic preparation of applicants to medical school, other health professions have also elected to utilize the test as an admissions assessment device. The results of the New MCAT battery should be judged in the context of the entry requirements and the type of knowledge and skills requisites of that particular profession. In addition, different weights for the various scores as well as the consideration of scores relative to other admissions information should depend upon the corresponding importance of the knowledge and skills assessed by the New MCAT to the requirements of the institution. A review of test content as well as the study of scores and performance of entrants over time by each admission committee will provide indicators of the degree to which levels of performance on each subtest coincide with local expectations for preparation of entering students in the areas tested.

NEW MCAT SCORES AS SUPPLEMENTS TO OTHER MEASURES OF ACADEMIC PERFORMANCE

The New MCAT offers admissions committees a standardized measure of academic performance administered to all examinees under equivalent conditions. Unlike measures of undergraduate achievement such as grade point average, New MCAT scores are free of variability which may be due to such factors as different standards and scales for evaluation, different reliability of the evaluations, etc.

By virtue of the fact that the New MCAT is a standardized test, it has certain limitations particularly when considered as the sole measure of performance. A standardized test, of necessity, represents a compromise with respect to specific requirements of an individual school in order to be generally valuable. It should also be remembered that a test is a fixed point assessment and neither reflects the dynamics of development nor the increased reliability that repeated or cumulative assessment can provide. Similarly, the New MCAT does not measure attributes of character or personality; nor does it provide a direct basis from which the examinee's motivation for the study of medicine can be assessed. As a standardized test of cognitive ability and achievement, the New MCAT describes entry characteristics of examinees. Continuing studies on examinee performance should result in the accumulation of evidence to justify further the use of the New MCAT to predict student performance in the medical school curriculum.

While New MCAT scores serve an important purpose in the admissions process, they cannot of themselves provide an adequate profile of the preparedness of the prospective candidate for medical school admission. New MCAT scores should be used in conjunction with the undergraduate academic record, description of course load, record in major field of study, and indicators of personal characteristics, work experience, level of involvement in activities, and apparent interest and motivation for the study of medicine.

Special caution should be exercised when interpreting test scores and other credentials of candidates who have had educational opportunities which vary from the typical group of medical school applicants. Similar to scores for other standardized tests, the New MCAT scores of educationally disadvantaged groups may require a special basis for interpretation. Additional factors which provide insight into the unique preparation and evidence of motivation of this group of applicants should therefore receive serious consideration in admissions decisions. As a diagnostic tool reflecting the strengths and weaknesses of educationally disadvantaged groups, New MCAT scores could be utilized as early indicators of the support services which such students might need to complete successfully the medical education program.

APPROPRIATE AND INAPPROPRIATE USE OF NEW MCAT SCORES

Scores on the six New MCAT areas of assessment are designed to be relatively independent and are purposefully reported separately. Independent consideration of the level of performance indicated by each score yields a profile of the relative strengths and weaknesses in medical school preparation of the candidate in each of the areas tested.

Summing or averaging scores is unsound for two basic reasons. First, each subtest is designed to assess specific content and skill areas. Furthermore, question types utilized in each subtest reflect these content and skill distinctions. Any type of composite score fails to take these important differences into account and results in the loss of a significant amount of information that may prove useful in counseling or in selection. A second reason for not averaging New MCAT scores concerns their respective predictive value. Simple arithmetic score averaging automatically weights the six scores equally when in fact they may not equally predict performance, or the committee may not want to weight each score as equally important in the selection process. Particular caution should be observed if one is considering the computation of a composite Science score using the Science Problem subtest and the three Science Knowledge area scores. Because items from the Science Problems subtest contribute twice to New MCAT scores (once to the Science Problems score and once to the disciplinary achievement scores), averaging scores on the four sciences areas or the derivation of an overall composite score for all six areas of assessment may yield a weighted score with unwanted or unexpected implications.

Since each institution evaluates New MCAT scores in its own setting by its own methods, adequate or inadequate scores cannot be established at this time. Performance may be assessed by relating an examinee's scores to the total population taking the test, to specific subpopulations or to other examinees applying to the same school. In general, a score of 13 on a given area of assessment would be considered high by any admissions committee, while a score of 3 would be consistently evaluated as being low. Scores falling in the middle ranges, however, will probably not be considered consistently high or low by all medical schools.

GUIDELINES FOR THE INTERPRETATION OF NEW MCAT SCORE PROFILES AND ASSOCIATED CAUTIONS

Admissions committees will typically use New MCAT scores to corroborate their judgment of academic ability as reflected in the academic record. Differences among the six New MCAT scores of a given applicant should not be considered unusual since each subtest was designed to measure relatively independent ability and knowledge areas. Discrepancies may arise from the possibility that applicants with a strong science background may not have equally strong Reading and Quantitative skills or the skills required in the Science Problems subtest.

As with results from any standardized measure of applicant ability and skill levels, the profile indicated by New MCAT scores should be examined in relation to other applicant data. These include course work performance, other indicators of academic ability, quality of undergraduate background,

and the desired personal characteristics of the applicants. In the instances where pertinent indicators present consistent results, the admissions committee will experience less difficulty in evaluating applicants. Generally, the applicant with both high New MCAT scores and a good academic record is defined as being intellectually qualified for entrance to medical school. Low New MCAT scores and a low GPA suggest inadequate cognitive qualifications.

Examples of New MCAT Score Profiles

Applicants will have varying profiles of scores. Many of these profiles will be frequently seen by admissions officers and others will be relatively infrequent. The following profiles illustrate some patterns of differences among scores on the various areas of assessment and the discussion provides some plausible interpretations of these profiles.

(1)

Profile	B	C	P	SP	SA:R	SA:Q
I	+	-	-	-	+	+
II	-	+	-	-	+	+
III	-	-	+	-	+	+

Profiles I, II, and III suggest that deficiencies in knowledge exist in specific science areas; the Science Problems score may be depressed because of this knowledge deficiency since the requisite skills cannot be manifested without an appropriate science knowledge base. The relatively good scores for the Skills Analyses subtests lend support to the assertion. If it were discovered that the examinee had not completed the science course prerequisites or had been exposed to relatively poor instruction, low scores in the areas noted above may indicate a lack of exposure rather than a lack of ability to assimilate scientific knowledge.

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*Note that for the profile displayed in the examples presented in this section:

+ indicates performance at a level above the mean
0 represents mean (average) performance
- signifies performance below the mean

(2)

Profile	B	C	P	SP	SA:R	SA:Q
IV	+	+	+	0	-	-

The score pattern is indicative of a strong science knowledge or information base. However, the average score in Science Problems suggests lesser facility with utilizing problem solving skills related to a science knowledge base. The below average scores in the Skills Analyses subtests indicate the examinee possesses some difficulty with interpretation and associated reasoning skills when presented with prose and graphic information. Consideration of other academic credentials may serve to provide further explanation for this pattern.

(3)

Profile	B	C	P	SP	SA:R	SA:Q
V	+	+	+	+	0	+

Profile V demonstrates a better than average background in the science and problem solving skills in scientific and quantitative contexts.

(4)

Profile	B	C	P	SP	SA:R	SA:Q
VI	0	-	-	-	+	-

Profile VI reflects the reverse situation where skills in reading and reasoning from prose formats appear to be developed to a greater degree than science knowledge or skills associated with reasoning from graphic presentation.

When the profiles presented by the six New MCAT scores are at variance with other academic criteria, the following should be considered:

(1) <u>High New MCAT scores, low GPA or other below average indices of academic performance</u>. One or more of the following factors may contribute to the apparent discrepancy: the examinee was a member of a highly competitive class in undergraduate college; the course grades do not reflect the examinee's knowledge, course grades may have been influenced by other factors such as attendance and promptness in submitting assignments; the individual was in an honors program or took unusually heavy or difficult course load.

(2) Low MCAT scores, high GPA or other above average indices of academic performance. The following factors should be considered in evaluating this situation: high grades at that particular college may not reflect superior abilities when compared with students at another college; grades are not accurate reflection of student's knowledge; the individual may have taken an easy course load; the examinee may have been ill or agitated while taking the New MCAT, or have general difficulty taking standardized tests.

In addition to the factors cited above, the individual's pattern of performance when retaking the New MCAT or grade patterns in undergraduate courses may be of significance. The types of completed courses and the pattern of the applicants' academic strengths and weaknesses should assist in the explanation of observed differences.

Since academic standards and grading practices vary considerably among undergraduate colleges, the admissions officers, as part of their review, can evaluate the applicant's record on the basis of their knowledge of a particular school and previous experience with its students. The applicant's comments, the premedical advisor's evaluation, letters of recommendation, and/or interviews could aid in the explanation of discrepancies between the academic record and New MCAT scores.

POLICY ON RETAKING THE NEW MCAT

It is a common occurrence for an individual to repeat an admissions test. AMCAS applications automatically provide admissions committees with New MCAT scores for the two most recent administrations at which an examinee was tested. A similar policy will pertain to scores sent to non-AMCAS institutions. The record of all performances on the New MCAT are subject to being reported to the schools to which the individual makes application. Policy regarding use of multiple sets of scores is determined by the individual medical schools.

Except in unusual circumstances, two sets of scores from two separate New MCAT administrations are equally valid measures of ability. It is relatively unlikely that a significant score change will occur from one testing to another without some relevant intervening experience. When meaningful score changes do occur, they will most likely be observed in the science related scores. Several reasons for score differences upon retesting are:

(1) Most recent scores higher.

The examinee may have completed requisite sciences or undertaken independent study to remedy deficiencies since the time of his/her first New MCAT administration.

(2) Most recent scores lower.

In the case of examinees such as college graduates who have been removed from an academic environment, the older scores may more adequately reflect the level of potential achievement.

(3) Inconsistent score pattern.

In addition to factors cited in the previous section, serious illness may have affected either set of scores.

CHAPTER 6*

PRELIMINARY NEW MCAT RESEARCH AND IMPLICATIONS FOR ADMISSIONS DECISIONS

Preceding chapters of this Interpretive Manual have discussed the background and goals of the New MCAT, the selection of content, student performance on the initial Spring 1977 testing, the derivation of scaled scores, the stability that can be expected of scores for an individual, and the interpretation of differences in scores in terms of the relative ability of different students and in terms of the strengths/weaknesses of a single student. All of this discussion has been designed to clarify correct uses and to discourage incorrect uses of the test scores.

The purpose of this chapter of the manual is to present very preliminary findings on the relationships between New MCAT performance and other measures of academic performance collected both before and during medical school. Because of the nature of the testing and admissions process, it was not possible to gather data relative to valid predictive uses of the New MCAT before the time of its first use as an admissions tool. For this reason, admissions committees will want to use considerable care in attributing meaning/relationships to particular score levels, score profiles, or differences between applicants' scores.

Over the coming years, individual schools and researchers, as well as the AAMC, will want to carry out local studies to examine and clarify valid predictive uses of the New MCAT, and to determine how to use this measure of applicant achievement in their admissions program most effectively. The predictive utility of any testing instrument is essentially a local matter. Appropriate uses of the test in one school may not be applicable, or may even be invalid, in another school which has a different curriculum, students entering at a different point in their academic program, etc. While the test provides a common yardstick against which to measure applicant skills and achievement, the optimal use of this yardstick for predictive purposes must be determined in the context of individual schools.

As predictive research is conducted, it will be accumulated and issued in a series of supplements to the present manual. In order to make the results of these local studies as useful as possible to other schools, an attempt will be made to encourage uniformity in analyses and in the format in which results are reported.

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CONCURRENT VALIDITY STUDIES - AN OVERVIEW

In an attempt to obtain preliminary information on the relationships of New MCAT scores to other measures of performance, a research form of the New MCAT was administered in the Fall of 1976 on a voluntary basis to students enrolled at a number of U.S. medical schools. Other measures of academic performance were obtained for these students, including undergraduate grades and previous MCAT scores, medical school course grades/evaluations, and NBME scores when they were available. A series of analyses were then carried out to determine the general representativeness of the student groups, the reliability of their New MCAT performance, and the nature of the relationships among the various performance measures. Before describing the samples, procedures, and results in more detail, it is essential to point out several factors which definitely limit the generality and utility of these preliminary findings:

1. The total number of students tested on a volunteer basis was relatively small, and in only a few schools and classes were the numbers tested as much as one-third of the class.

2. Because of the need to limit the testing time required, each student could receive only three out of the four New MCAT subtests (Skills Analysis: Reading, Science Knowledge, Science Problems, and Skills Analysis: Quantitative), thus further reducing the numbers of students available for analysis.

3. Students had no particular extrinsic motivation to perform well on the research form of the New MCAT, and were not asked to brush up or otherwise prepare themselves for the test. On the basis of data from several sources, it became obvious that a number of the medical students who took part in this did so in only a nominal way. For example, some left the testing session between subtests while others left at some point during the subtest. In addition, others made only a perfunctory effort to answer the questions and/or skipped large numbers of questions. To attempt to correct for the obvious error that inclusion of the results for such persons would produce, they were deleted from the sample as if they had not taken the particular subtest(s) at all. The criterion for such a decision was that the examinee omitted one-sixth or more of the items in a given subtest.

4. Performance measures to which New MCAT performance can be related were only concurrent in the sense of their availability before or shortly after the research administration. In several cases the performance itself took place as much as a year earlier. The only relationships examined which could in any sense be considered predictive are those between New MCAT scores for students tested as entering Fall 1976 freshmen and their mid-first year course evaluations.

5. With the exception of New MCAT, MCAT, and NBME Part I scores, the reliability of the other academic performance measures (notably course grades) is completely unknown.

6. To the extent that the students tested are highly homogeneous, either in their performance on the New MCAT or their performance on the measures with which it is being compared, the correlations will be greatly restricted. Where there is no variation on a measure (e.g., all students receive "pass" grades), a correlation coefficient has no meaning at all.*

7. Low values of a correlation coefficient may not be inconsistent with an acceptable level of predictive validity. For example, if a group of students all scored high as entering freshmen medical students and all "passed" a given course, the resultant low correlation coefficient is not inconsistent with the validity of the test for prediction of performance in that course for a more heterogeneous applicant group.

Given all of these qualifications, results of this research form administration will be presented below insofar as justifiable conclusions can be drawn at this time. The populations and performance measures reported have been restricted to those considered meaningful in view of the underlying sample sizes, heterogeneity of the performance measures, and representativeness of the groups tested in relationship to their entire class.

RELATIONSHIPS BETWEEN NEW MCAT SCORES OF ENTERING STUDENTS AND THEIR FIRST SEMESTER PERFORMANCE IN MEDICAL SCHOOL

As noted above, the research form of the New MCAT was administered to a number of entering freshman medical students in the Fall of 1976. Information was subsequently obtained on their performance at the end of their first semester in medical school. The relationships between New MCAT scores and performance were analyzed on a school-by-school basis unless overall performance composites were normally used at that school.

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*The impact on the correlations of such homogeneity in performance can be seen in the fact that there is a strong relationship (r=.58) between 1) the product of the standard deviation of the New MCAT Science Problems score with the earlier MCAT Science scores, and 2) the correlation of the two science scores.

TABLE VI-1

COMPARISON OF PRIOR MCAT MEAN SCORES OF RESEARCH STUDY PARTICIPANTS
WITH MEAN SCORES OF ALL ENTRANTS IN THE SAME YEARS

Class	Sample	Statistic	Subtest: Verbal	Quantitative	General Information	Science
76-77 (1st Year)	Research Group (N=650)	Mean	561	628	542	613
		Standard Deviation	90	85	76	69
	All Entrants (N=15,774)	Mean	573	633	549	618
		Standard Deviation	86	84	76	74
75-76 (2nd Year)	Research Group (N=200)	Mean	567	627	544	613
		Standard Deviation	78	76	72	81
	All Entrants (N=15,192)	Mean	575	620	550	615
		Standard Deviation	81	74	77	81
74-75 (3rd Year)	Research Group (N=107)	Mean	582	631	574	616
		Standard Deviation	86	68	77	77
	All Entrants (N=14,943)	Mean	563	611	559	603
		Standard Deviation	87	76	79	78

Description of First Year Sample

A total of 650 first year students were tested at 15 different schools. In four schools (which will be referred to as Schools A, B, C, and D), there were a sufficient number of students tested to justify presentation of the results in this manual. In these schools, the numbers of entering students tested were 68, 81, 86, and 143 constituting 55%, 89%, 64%, and 79% of the students in their respective classes.

In order to evaluate the overall representativeness of the sample of first year students tested, their previous MCAT test scores were compared with those of all Fall 1976 U.S. medical school entrants. The results in Table VI-1 demonstrate that the total first year group tested was, on the average, only very slightly less able than the total entrant population in 1976. The more relevant comparisons - between the students tested at Schools A-D and their classmates - will be presented below in describing the results of the research administration. It can generally be stated, however, that the students whose results are used below can generally be considered representative of their classes in terms of ability, as measured by their previous MCAT scores.

Results for School A

The 68 students tested at School A constituted about one-half of the entering freshman class. In terms of ability, they averaged only slightly lower than the total class as judged by their MCAT test scores (see Table VI-2).

TABLE VI-2

COMPARISON OF MCAT MEAN SCORES OF SCHOOL A STUDENTS TESTED WITH MEAN SCORES OF ENTIRE SCHOOL A FALL 1976 CLASS

MCAT Subtest	Students Tested Mean	Students Tested N	Total Class Mean	Total Class N
Verbal	499	68	504	123
Quantitative	556	68	599	123
General Information	485	68	492	123
Science	567	68	575	123

TABLE VI-3

MEANS, STANDARD DEVIATIONS AND CORRELATION COEFFICIENTS FOR FIRST SEMESTER PERFORMANCE VS. NEW MCAT SCORES FOR STUDENTS TESTED FROM FALL '76 ENTERING CLASS:

SCHOOL A

New MCAT Area of Assessment	Test Statistics Mn	SD	N	Courses: Anatomy r	N	General Biochemistry r	N	Introduction to Psychiatry r	N	Basic Neuro-science r	N	Introduction to Patient Care r	N
SA:R	6.0	2.5	43	.21	43	.23	43	.43***	43	.29	40	.39***	43
SA:Q	6.6	2.5	42	.44***	41	.33*	41	.39***	41	.35*	39	.37**	41
B	6.5	2.5	26	.40*	25	.48**	25	.44*	25	.41*	25	.29	25
C	6.3	1.8	25	.36	24	.73***	24	.40*	24	.56***	24	.25	24
P	5.2	1.7	24	.53***	23	.78***	23	.31	23	.60***	23	.24	23
SP	6.0	1.7	48	.35**	47	.48***	47	.12	47	.49***	46	.04	47
Course Statistics Mn				75.8		79.2		79.8		81.7		84.9	
Course Statistics SD				6.0		8.0		6.3		6.0		5.6	
Course Statistics N				66		67		66		63		66	

*Significant at .05 level
**Significant at .02 level
***Significant at .01 level

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Entering students at School A generally performed about two scaled score points below the total Spring 1977 examinee population group on equivalent New MCAT forms. This level of performance must be considered in view of the qualifications on motivation and preparation mentioned earlier. In their first semester, students took five courses and were graded on a 101 point (0-100) scale in each course. Over the five courses, grades ranged from 60 (unsatisfactory) to 98 (honors) while most fell in the 71-85 (satisfactory) range.

The correlations between New MCAT scores and course grades are presented in Table VI-3, which also reports the number of students upon which each correlation is based. This number is a function of the number of students who were given a particular subtest of the New MCAT (e.g., N = 43 for Skills Analysis: Reading), and of the number of those who took a given course (e.g., 40 received grades in Basic Neuroscience among the 43 taking Skills Analysis: Reading).

The statistical significance of each of the correlations is also presented in Table VI-3. In general, the New MCAT science areas of assessment show a substantial predictive relationship to basic medical sciences course grades, and the pattern of correlations is a reasonable one. Performance in General Biochemistry and Basic Neuroscience, for example, are very significantly related to both Science Knowledge and Science Problems scores. Biology is the least closely related among the sciences. The Skills Analysis subtests, on the other hand, do not show a significant relationship to basic science grades, but are related to grades in Introduction to Psychiatry and Introduction to Patient Care.

In interpreting these correlations, it is important to bear in mind the variability (standard deviation) of student performance on both the New MCAT research form and on the criteria - medical school grades. These data are reported as marginal entries in Table VI-3.

The means and standard deviations reported are based on all the available students having data on the variable. As a result, the numbers of cases on which the correlation coefficients are based are fewer than the marginal N's. These reductions in the calculation sample sizes do not present any problem however, since the standard deviations of the variables in the calculation samples closely approximate those of the total sample.

In general, and this is an important point which applies to all of the data to be reported in this chapter, as the variability (standard deviation) of the criterion measures increases, both the number of significant correlations and the level of significance of the correlations also increases. For School A, the General Biochemistry course has the largest standard deviation (8.0) while Introduction to the Patient has the smallest (5.6). An examination of the correlation coefficients for these two variables clearly shows more frequent significant relationships with the General Biochemistry course. When the range and variability of a criterion measure is restricted, there is no reason to expect a particularly high correlation coefficient. Nevertheless, significant correlations are found, indicating that the New MCAT areas of

assessment are reasonably predictive of grades even among relatively homogeneous students.

Results for School B

The students tested at School B can be considered representative of their class in terms of ability, as judged by their MCAT scores (see Table VI-4).

TABLE VI-4

COMPARISON OF MCAT MEAN SCORES OF SCHOOL B STUDENTS TESTED WITH MEAN SCORES OF ENTIRE SCHOOL B FALL 1976 CLASS

MCAT Subtest	Students Tested Mean	N	Total Class Mean	N
Verbal	546	81	546	91
Quantitative	629	81	632	91
General Information	540	81	536	91
Science	626	81	621	91

Table VI-5 shows that on the New MCAT research form they scored at or slightly above the mean of the Spring 1977 examinees in all areas except Physics (mean scaled score = 6.8) and Science Problems (7.6) and are a slightly more homogeneous group than the examinees, as would be expected (SD = 1.8 to 2.1 as compared with SDs of 2.4-2.6 for examinees).

During the first semester these students took Gross Anatomy and Biochemistry, and were evaluated on a 101 point scale (0-100). Biochemistry grades attained by these students ranged from 67 to 92, while Gross Anatomy grades ranged from 85 to 98. The distribution of grades in both classes was approximately normal.

The correlations between New MCAT Science Problems scores and grades in both courses are highly significant. Skills Analysis: Reading scores are highly correlated with Anatomy grades and Skills Analysis: Quantitative scores with Biochemistry grades. Biology and Chemistry scores show a modest correlation with grades in Anatomy and Biochemistry. Again, interpretation of the magnitude of these correlations must take into account the fact that there is

TABLE VI-5

MEANS, STANDARD DEVIATIONS AND CORRELATION COEFFICIENTS FOR FIRST SEMESTER PERFORMANCE VS. NEW MCAT SCORES FOR STUDENTS TESTED FROM FALL '76 ENTERING CLASS:

SCHOOL B

New MCAT Area of Assessment	Test Statistics Mn	SD	N	Courses: Gross Anatomy r	N	Biochemistry r	N
BA:R	8.8	2.1	53	.38***	53	.22	53
BA:Q	8.6	2.1	51	.18	51	.34**	50
B	8.3	2.1	50	.30*	50	.19	49
C	8.0	2.0	50	.31*	50	.31*	49
P	6.8	2.0	47	.28	47	.25	46
SP	7.6	1.8	73	.32***	73	.38***	72
Course Statistics		Mn		92.8		84.0	
		SD		2.9		5.0	
		N		82		81	

*Significant at .05 level
**Significant at .02 level
***Significant at .01 level

not a great deal of variability in the student performance evaluations recorded in either medical school course (the criteria) and relatively low variability in the New MCAT scores (the predictors). However, even a sizeable standard deviation makes little difference if the two variables are intrinsically uncorrelated. Consider the correlation of the New MCAT Skills Analysis: Reading subtest with Gross Anatomy (r = .38) and Biochemistry (r = .22) course grades. Even though the standard deviation of the Biochemistry grades is almost twice that of Gross Anatomy grades, the Biochemistry vs. Skills Analysis: Reading correlation is much smaller. That such is the case suggests a greater intrinsic correlation between Skills Analysis: Reading and Gross Anatomy than between Skills Analysis: Reading and Biochemistry, especially since both correlations are based on the same subsample of 53 first year medical students.

Results for School C

At School C, 64% of the entering class was tested. By comparison with the total class, those tested were very slightly lower in terms of MCAT Verbal and General Information scores, but equivalent in terms of Math and Science scores (see Table VI-6).

TABLE VI-6

COMPARISON OF MCAT MEAN SCORES OF SCHOOL C STUDENTS TESTED WITH MEAN SCORES OF ENTIRE SCHOOL C FALL 1976 CLASS

MCAT Subtest	Students Tested Mean	N	Total Class Mean	N
Verbal	572	86	581	135
Quantitative	613	86	612	135
General Information	531	86	542	135
Science	582	86	581	135

Students at School C scored .4 to 1.6 scaled score points below the Spring 1977 examinee mean on the New MCAT areas of assessment (see table VI-7).

TABLE VI-7

MEANS, STANDARD DEVIATIONS AND CORRELATION COEFFICIENTS FOR FIRST SEMESTER PERFORMANCE VS. NEW MCAT SCORES FOR STUDENTS TESTED FROM FALL '76 ENTERING CLASS:

SCHOOL C

New MCAT Area of Assessment	Test Statistics Mn	SD	N	Courses: Gross Anatomy r	N	Cellular & Molecular Biology r	N	Micro-anatomy r	N	Embryology r	N	Composite r	N
SA:R	7.4	2.2	56	.41***	53	.09	50	.22	53	.21	55	.38***	55
SA:Q	7.6	2.2	56	.35***	53	.16	50	.25	53	.40***	55	.48***	55
B	8.0	2.5	53	.46***	49	.18	43	.41***	49	.44***	51	.45***	51
C	7.0	2.4	52	.58***	49	.30*	43	.39***	49	.29*	51	.58***	51
P	6.4	2.5	47	.53***	45	.33*	40	.47***	45	.18	47	.56***	47
SP	7.3	2.1	76	.47***	71	.17	65	.30***	71	.28**	74	.46***	74
Course Statistics	Mn			2.1		2.0		2.1		2.2		2.1	
	SD			.4		.3		.4		.4		.3	
	N			81		75		81		84		84	
	#Honors (3)			10		3		10		16			
	#Pass (2)			68		70		70		67			
	#Fail (1)			3		2		1		1			

*Significant at .05 level
**Significant at .02 level
***Significant at .01 level

In their first semester, students took Gross Anatomy, Cellular and Molecular Biology, Microanatomy, and Embryology. They were evaluated on a 3 point scale (Honors, Pass, and Fail) in each course and in addition were given an overall composite evaluation which was computed as a weighted average such that Gross Anatomy = 36%, Cellular and Molecular Biology = 33%, Microanatomy = 26%, and Embryology = 5% of the total grade. The means, standard deviations and distributions of the grades are also given in Table VI-7. From these data, it is clear that none of the grade distributions approaches normality and that, of the four individual courses, Gross Anatomy shows the greatest amount of variability while Cellular and Molecular Biology shows the least. The possible effects of this restricted range of grades is illustrated by the correlations of these two courses with the six New MCAT scores. All six of the correlations with Gross Anatomy are highly significant while only two of the correlations with Cellular and Molecular Biology are significant and these only at .05 level of significance.

The correlations between all six New MCAT scores and overall performance in the first semester are highly significant. All scores show a similar high correlation with Gross Anatomy and the four science scores with Microanatomy. As indicated above, the correlations between New MCAT scores and Cellular and Molecular Biology are not nearly as significant. Skills Analysis: Quantitative, Biology, Chemistry, and Science Problems scores are significantly related to performance in Embryology ($p \leq .05$).

Results for School D

Nearly 80% of the entering class was tested at School D, and this group was representative of all entering students at School D in terms of their earlier MCAT performance (see Table VI-8).

TABLE VI-8

COMPARISON OF MCAT MEAN SCORES OF SCHOOL D STUDENTS TESTED WITH MEAN SCORES OF ENTIRE SCHOOL D FALL 1976 CLASS

MCAT Subtest	Students Tested Mean	N	Total Class Mean	N
Verbal	545	143	547	180
Quantitative	610	143	610	180
General Information	548	143	549	180
Science	600	143	599	180

TABLE VI-9

MEANS, STANDARD DEVIATIONS AND CORRELATION COEFFICIENTS FOR FIRST SEMESTER PERFORMANCE VS. NEW MCAT SCORES FOR STUDENTS TESTED FROM FALL '76 ENTERING CLASS:

SCHOOL D

New MCAT Area of Assessment	Statistics Mn	SD	N	Courses: Gross Anatomy r	N	Cellular & Molecular Biology r	N	Histology r	N	Embryology r	N
SA:R	8.1	1.8	94	.07	94	.24**	90	.12	94	.20*	94
SA:Q	8.0	2.0	93	-.02	91	.30***	87	.07	92	.21*	92
B	7.3	1.6	72	.38***	70	.47***	68	.31***	71	.28**	71
C	6.5	1.6	69	.35***	67	.35***	65	.35***	68	.23	68
P	6.0	1.7	66	.34***	64	.43***	63	.16	65	.10	65
SP	6.8	1.6	111	.17	109	.42***	105	.25**	110	.25**	110
Course Statistics: Mn				4.1		3.9		4.2		4.7	
SD				.6		.9		.6		.5	
N				140		134		141		141	
#Excellent (5)				30		37		43		102	
#Good (4)				93		61		88		36	
#Satisfactory (3)				16		29		9		2	
#Passing (2)				1		5		1		1	
#Failure (1)				0		2		0		0	

*Significant at .05 level
**Significant at .02 level
***Significant at .01 level

By comparison with Spring 1977 examinees, they scored at the mean on the Skills Analysis subtests, and from .7 to 2.0 points below the mean on the science areas of assessment (see Table VI-9). They were much more homogeneous in their performance on all six of the New MCAT areas of assessment than the total examinee population with standard deviations only 64-80% as large as those of the Spring 1977 examinee group.

School D students took four basic science courses in the first semester and were graded using letter grades (A-F). The means, standard deviations and distributions of these courses are presented as part of Table VI-9. As with School C, these distributions reveal a great deal of variability in the range of the grades assigned in the four courses, with Cellular and Molecular Biology having the largest standard deviation and Embryology the smallest. The situation is further complicated by the fact that the distribution of Embryology grades is highly skewed - 72% of the Embryology students received grades of A. As before, the correlations of the New MCAT areas of assessment with the most variable course (Cellular and Molecular Biology) are much higher than those with the least variable course (Embryology).

The New MCAT scores of these students are all highly correlated with their performance in Cellular and Molecular Biology. Science Knowledge scores are related to performance in Gross Anatomy; Biology, Chemistry, and Science Problems to Histology; and Biology and Science Problems, and to a lesser extent the Skills Analysis subtests, are related to Embryology.

Discussion of First Year Results

Considering the total picture presented by the foregoing results, it is clear that the New MCAT areas of assessment are valid and useful predictors of performance in a number of diverse setting and content areas within undergraduate medical education. For 14 of the 16 criteria studies at least one of the six New MCAT assessment areas was significantly related to the criterion at or beyond the .01 level of significance. The other two criteria were also significantly related to New MCAT scores, but at a lower level of significance. These results were obtained in spite of several limitations which were discussed in more detail above:

- Restricted variability on the New MCAT areas of assessment
- Unknown motivation to perform on the New MCAT
- Restricted variability on the performance measures
- Skewed distribution on the performance measures
- Unknown reliability of the performance measures
- Restricted range on the performance measures

Given such limitations it is encouraging that significant correlations were found since it implies that among the more highly motivated and heterogeneous applicant population the correlation and thus the validity of the assessment areas would be even higher.

While the results do support the relationship of New MCAT performance to performance in medical school, they are not yet sufficient to determine how best to use combinations of test scores (e.g., in regression equations) to predict performance, especially for the applicant population. The results certainly support the use of the New MCAT as diagnostic of student strengths and weaknesses, and of possible need for specific remedial/support services.

RELATIONSHIPS OF FIRST YEAR PERFORMANCE TO NEW MCAT SCORES OBTAINED AT THE BEGINNING OF THE SECOND YEAR

In the fall of 1976, the research form of the New MCAT was administered to 52 second year students at one U.S. medical school which will be referred to as School X.* The performance of these students during the first year they completed in medical school can thus be compared with the scores they subsequently obtained on the New MCAT.

Results for Second Year Students

Comparison of previous MCAT scores suggests that the 52 students are representative of the remainder of their class (see Table VI-10). During this first year, School X students took a total of 12 courses. Course evaluations were given on a 3 point scale (Honors, Pass, and Fail). In most instances nearly all of the students tested on a given New MCAT area of assessment obtained the same course grade, and in several cases all obtained the same grade (Pass). No correlations can be calculated in the latter case. The distribution of grades received for each course is shown in Table VI-11.

This group of second year students scored above the Spring 1977 examinee means on every New MCAT area of assessment except Physics, and are fairly homogeneous in achievement, as evidenced by the low variability (SDs) of their scores.

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*Additional second year students were tested at 11 other schools, but the numbers at any one school are two small to report.

TABLE VI-10

COMPARISON OF MCAT MEAN SCORES OF SCHOOL X STUDENTS TESTED WITH MEAN SCORES OF ENTIRE SCHOOL X FALL 1975 CLASS

MCAT Subtest	Students Tested Mean	N	Total Class[1] Mean	N
Verbal	593	51	587	171
Quantitative	673	51	665	171
General Information	566	51	565	171
Science	644	51	640	171

[1]Includes students leaving school prior to the start of the second year.

The correlations between first year course grades, overall first year GPA, and New MCAT scores are given in Table VI-11. Only Skills Analysis: Reading shows a significant correlation with first year GPA. Various areas of assessment show significant correlations with individual grades. Considering the extremely low variability in first year grades in any given course, and the low variability in New MCAT scores, the fact that significant correlations were obtained at all with individual course grades is noteworthy. Essentially this suggests that the New MCAT was highly successful in differentiating the one or two honors students from the passing students, and from the one or two students failing a given course.

To obtain a clear picture of the results for School X, the students were divided into three groups on the basis of the number of "honors" or "H" grades they received. The observed distribution of grades made such a three-way division fairly natural, separating those students earning roughly 25% honors grades or less (N = 39), 25-50% honors (N = 10), and >50% honors (N = 2). In this latter category the two students actually had >90% honors grades.

The mean scaled score on each New MCAT area of assessment was calculated for students in each of the three groups. The results are shown in Table VI-12. For nearly every assessment area, students who had received higher grades in the first year tended to show higher performance on the New MCAT.

TABLE VI-11

MEANS, STANDARD DEVIATIONS, DISTRIBUTIONS AND CORRELATION COEFFICIENTS FOR FIRST YEAR PERFORMANCE
NEW MCAT SCORES OBTAINED AT THE BEGINNING OF THE SECOND YEAR: SCHOOL X

New MCAT Area of Assessment	Test Statistics			Courses																									
				Gross Anatomy		Biochemistry I		Biochemistry II		Microanatomy		Behavioral Science		Microbiology		Neuroscience		Physiology I		Physiology II		Immunology		Genetics		Pathology		1st Year GPA	
	Mn	SD	N	r	N	r	N	r	N	r	N	r	N	r	N	r	N	r	N	r	N	r	N	r	N	r	N	r	N
SA:R	9.8	1.6	28	.23	27	.19	27	.40*	27	.23	27	.42*	27	.23	27	.16	27	.22	27	.44**	27	.16	27	.40*	27	.20	27	.43**	27
SA:Q	9.8	1.7	39	.09	37	.01	37	.01	38	.25	37	-.04	38	.19	38	.15	38	.02	38	.35*	38	.00[c]	38	.27	38	-.07	38	.17	38
B	10.5	1.4	28	.01	28	.29	27	-.02	28	.11	28	.14	28	.17	28	.00[c]	28	.16	28	.36*	28	.16	28	.43**	28	.30	28	.32	28
C	8.4	2.1	26	.25	26	.29	25	-.04	26	.34	26	-.37*	26	.38*	26	.00[c]	26	.07	26	.28	26	.38*	26	.13	26	-.17	26	.14	26
P	6.4	2.3	22	-.07	22	.32	21	-.35	22	-.23	22	-.24	22	.00[c]	22	.00[c]	22	-.13	22	.30	22	.00[c]	22	.29	22	-.22	22	-.04	22
SP	8.3	1.8	41	.13	40	.29	39	.12	40	.21	40	-.15	40	.26	40	.23	40	.10	40	.35*	40	.18	40	.21	40	.21	40	.25	40
Course Statistics	Mn			2.1		2.2		2.2		2.1		2.4		2.1		2.0		2.1		2.2		2.0		2.2		2.2		2.1	
	SD			.3		.4		.4		.3		.5		.2		.1		.3		.5		.1		.4		.4		.2	
	N			50		50		51		50		51		51		51		51		51		51		51		51		51	
	#Honors (3)			4		8		11		5		18		3		1		6		10		1		10		10			
	#Pass (2)			46		42		40		45		33		48		50		45		39		50		40		41			
	#Fail (1)			0		0		0		0		0		0		0		0		2		0		0		0			

*Significant at the .05 level
**Significant at the .02 level

[c]Criterion score displays no variability

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TABLE VI-12

NEW MCAT PERFORMANCE OF SECOND YEAR STUDENTS AT SCHOOL X
WHO HAD DIFFERING LEVELS OF OVERALL FIRST YEAR PERFORMANCE*

	Average Pass N = 30			Honors N = 10			High Honors N = 2		
New MCAT Area of ssessment	Mean Scaled Score	SD	N	Mean Scaled Score	SD	N	Mean Scaled Score	SD	N
A:R	9.6	1.6	20	11.0	0.8	3	11.0	0.0	2
A:Q	9.7	1.5	27	9.5	2.5	10	11.0	0.0	1
B	10.1	1.6	21	11.2	1.1	6	12.0	0.0	1
C	8.1	2.1	20	8.6	1.5	5	12.0	0.0	1
P	6.3	1.7	17	7.0	3.6	5	-	-	0
SP	8.2	1.8	31	8.5	1.8	6	10.5	0.5	2

Actual distribution of grades for first year performance groups were as follows:

"Average Pass" = 0-18% honors grades, remainder pass or fail grades
"Honors" = 27-45% honors grades, remainder pass grades
"High Honors" = >90% honors grades, remainder pass grades

RELATIONSHIP OF NBME PART I SCORES TO NEW MCAT SCORES OBTAINED AT THE BEGINNING OF THE THIRD YEAR OF MEDICAL SCHOOL

The third year students who were tested on the New MCAT research form generally had scores available on Part I, the basic medical sciences portion, of the NBME examinations. These scores had been recorded from 1-6 months prior to the New MCAT scores, that is, at the end of the second or beginning of the third year in medical school. It should be kept in mind that the NBME tests are used differently at different medical schools and often even with respect to different courses in the same medical school. In some courses, scores may count as part of the course grade. Thus not all of the students whose scores are used in this section prepared or took the NBME tests with the same motivation.

Description of Third Year Sample

A total of 107 third year students participated in the New MCAT administration at five different medical schools. In only one school was an appreciable fraction of the third year class tested - 44 out of 171 students. Results will be presented for the total group (N = 107) and for this single school, School Z.

Results for Third Year Students

The comparisons between MCAT scores of the samples and their reference populations is shown in Table VI-13.

TABLE VI-13

COMPARISON OF MEAN MCAT SCORES OF THIRD YEAR STUDENTS TESTED WITH MEAN SCORES OF ALL U.S. MEDICAL SCHOOL ENTRANTS IN FALL 1974

MCAT Subtest	Students Tested		Total Entering 1974 Class	
	Mean	N	Mean	N
Verbal	582	107	563	14,943
Quantitative	631	107	611	14,943
General Information	574	107	559	14,943
Science	616	107	603	14,043

TABLE VI-14

MEANS, STANDARD DEVIATIONS AND CORRELATION COEFFICIENTS FOR NBME PART I TEST PERFORMANCE VS. NEW MCAT SCORES:

ALL THIRD YEAR STUDENTS TESTED

New MCAT Area of Assessment	Statistics Mn	SD	N	Anatomy	Physiology	Biochemistry	Pathology	Microbiology	Pharmacology	Behavioral Science	Total r	N
SA:R	9.1	1.6	68	-.03	.00	-.03	-.02	.05	-.15	.19	-.01	64
SA:Q	9.3	1.8	68	.02	.28**	-.03	.07	.06	.06	.22	.11	65
B	10.5	1.6	50	.49***	.40***	.23*	.42***	.23	.33**	.42***	.44***	56
C	7.3	1.0	54	.28*	.51***	.38***	.31**	.18	.38***	.33**	.43***	52
P	7.2	2.2	52	.38***	.39***	.38***	.29*	.26*	.35***	.43***	.46***	50
SP	8.4	1.8	86	.44***	.55***	.40***	.45***	.38***	.46***	.25*	.52***	82
Multiple r with Science Knowledge				.53***	.55***	.43***	.45***	.29	.44***	.50***	.55***	
NBME Statistics	Mn			518	523	517	514	512	499	529	521	
	SD			91	89	98	100	91	106	96	95	
	N			104	104	104	104	104	104	104	103	

*Significant at .05 level
**Significant at .02 level
***Significant at .01 level

The results - mean New MCAT scores, correlations of New MCAT and NBME scores, are shown in Table VI-14 for all of the third year students. Similar information for School Z students is presented in Tables VI-15 and VI-16.

TABLE VI-15

COMPARISON OF MEAN MCAT SCORES OF SCHOOL Z THIRD YEAR STUDENTS WITH MEAN SCORES OF ALL ENTRANTS IN FALL 1974 CLASS AT SCHOOL Z

MCAT Subtest	Students Tested Mean	N	Total Class Mean	N
Verbal	602	44	580	171
Quantitative	652	44	649	171
General Information	572	44	652	171
Science	630	44	622	171

In general, the third year students in the present study are of slightly higher ability than the total 1974 entering class at all U.S. medical schools. The School Z students tested are also slightly higher in ability than the average of students in their entering class at Z. However, since some students would have withdrawn prior to the third year, there is no reason to think these students are not representative of their remaining classmates, both overall and at School Z.

On the New MCAT areas of assessment, the third year students scored above the Spring 1977 examinees' means on the two Skills Analysis, Biology, and Science Problems assessment areas, but slightly below the mean on Chemistry and Physics.

It was observed that the proportions of third year medical school students who did not attempt all of the test items was greater than that of Spring 1977 examinees, ostensibly taking the test for application to medical school. Specifically, on the last five items in the Chemistry and Physics assessment areas, about 96% of the medical students attempted the last five items; however, in Science Problems, this dropped substantially, to about 75%. Omission rates were above 10% on the last 12 Problems items. The Skills Analysis: Reading and Skills Analysis: Quantitative omission rates were only about 1-2%, not substantially higher than for examinees, and were very low on the initial segments of all subtests. Since these students had the same amount of time

TABLE VI-16

MEANS, STANDARD DEVIATIONS AND CORRELATION COEFFICIENTS FOR NBME PART I TEST PERFORMANCE VS. NEW MCAT SCORES:

SCHOOL Z STUDENTS

New MCAT Area of Assessment	Statistics Mn	SD	N	Anatomy	Physiology	Biochemistry	Pathology	Microbiology	Pharmacology	Behavioral Science	Total
SA:R	9.1	1.6	28	-.11	.02	-.13	-.12	.10	-.36	.04	-.15
SA:Q	9.7	1.8	27	-.14	.20	.04	.04	.16	.04	.05	.06
B	11.0	1.4	35	.60**	.41	.38*	.43*	.21	.26	.51	.47**
C	8.0	1.6	22	.41*	.35	.50**	.25	.28	.43*	.26	.45*
P	7.8	2.2	22	.33	.53***	.44*	.27	.54***	.55***	.37	.54***
SP	9.0	1.7	37	.48***	.62***	.55***	.54***	.54***	.57***	.31*	.62***
NBME Statistics		Mn		534	539	544	542	514	531	533	542
		SD		91	97	104	92	91	98	86	99
		N		44	44	44	44	44	44	44	43

*Significant at .05 level
**Significant at .02 level
***Significant at .01 level

for each subtest as Spring 1977 examinees, the higher omission rates presumably reflect a lesser level of motivation. It seems reasonable, then to consider their Science Problems scores, at least, to be an underestimate of the achievement of these students.

The correlations between the four New MCAT science scores and NBME scores form a reasonable pattern, with generally higher correlations between those areas of assessment which are, on a logical basis, most similar in content.* Those correlations which are statistically significant have been indicated. However, the general pattern of correlations, is probably the most striking finding. Multiple correlations between the Science Knowledge scores and each NBME score are all substantial, with the exception of the correlation with Microbiology.

The correlations between the two Skills Analysis subtests and NBME scores are generally very low. Interpretation of this finding at this initial step is hazardous. More in depth analysis of both the criterion (NBME, Part I) and the New MCAT performance is indicated. However, it is clearly possible to differentiate among these third year students on the basis of their technical knowledge base, either relative to science principles and content taught at the college level (New MCAT) or relative to content taught at the medical school level. Also, the knowledge of these two as demonstrated on the two test series is generally related in an expected manner based upon the logical relationships between content in the various subtests.

SUMMARY

The very preliminary research study reported here certainly does not constitute an adequate "validity" study, in the best sense of the word. However, strong relationships between New MCAT scores and other measures of medical school performance were observed. These relationships can provide additional reassurance to those working with the new test scores in the already difficult environment of medical school admissions that the test is measuring important attributes of candidates. Based upon the data provided in this chapter, differences among candidates will have consequences in terms of their subsequent performance in medical school.

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*Recall that the Science Problems score is not independent of the scores in Biology, Chemistry, and Physics.

SPEEDEDNESS OF THE NEW MCAT

An important goal in the development of the New MCAT was to produce subtests on which the examinees' speed of responding would not influence their scores. This was accomplished by setting time limits such that almost all of the examinees could be expected to complete all of the items. Evidence of speededness is usually presented in terms of the percentage of the examinees who attempt the last item or some item very near the end of the test. The joint APA-AERA-NCME Standards for Educational and Psychological Tests, p. 48, states: "If the percentage is below 90, a more penetrating study is needed to show that individual differences on the test do not reflect speed to any great extent" for those tests which claim to be non-speeded, or power, tests. Horst (1966) states: "Many of the standardized tests and testing programs are so timed that more than half or up to 70 or so per cent of the examinees finish all of the items....The College Entrance Examination Board tests are an example of this."[1]

The table below presents, for each of the six New MCAT areas of assessment, the percentage of Spring, 1977 examinees attempting the first five items, the middle five items and the last five items.

AVERAGE PERCENTAGE OF SPRING, 1977 EXAMINEES ATTEMPTING SELECTED NEW MCAT ITEMS

Area of Assessment	First Five Items	Middle Five Items	Last Five Items
SA:R	99.9	99.6	99.1
SA:Q	99.7	99.8	99.6
B	99.3	99.5	99.0
C	99.3	99.4	99.0
P	99.1	99.4	96.6
SP	99.6	99.0	97.5

[1] Horst, P. Psychological Measurement and Prediction. Belmont, California: Wadsworth, 1966, p.61.

On the basis of these data it is clear that the New MCAT subtests are not speeded for the vast majority of examinees.

CONVERTING RAW SCORES TO SCALED SCORES ON THE NEW MCAT

Scaled scores for each of the six New MCAT areas of assessment are obtained by first determining the raw score, or the number right for each area, and then looking this raw score up in the appropriate conversion table to determine the scaled score. The six raw-to-scaled score conversion tables were developed to produce scaled score distributions with the following characteristics for the baseline population of Form 1 (Spring 1977) New MCAT examinees:

15 scaled score points
Mean scaled score of approximately 8.0
Standard deviation of approximately 2.5
Standard error of measurement of approximately 1.0

Insomuch as the same raw-to-scaled score conversion tables will be used for subsequent New MCAT forms, the mean, and to a lesser extent the actual standard deviation and standard error of measurement, of the scaled distributions will vary to the extent that the ability level of a particular examinee group varies from that of the Spring 1977 baseline group. Such shifting in the parameters of the scaled score distribution is necessary to accomplish another goal in the assignment of scaled scores. That is, to have a given scaled score represent the same absolute level of ability regardless of when an examinee takes the New MCAT. It is to meet this goal that subsequent forms of the New MCAT will be equated to Form 1 and that the same raw-to-scaled score conversion tables will be used.

The procedure used to develop the raw-to-scaled score conversion tables, based on Spring 1977 examinees, was the same for each of the six areas of assessment and is described below:

1. The raw, number right score for each examinee in the baseline population was determined.
2. The mean and standard deviation (S.D.) of the raw scores was calculated.
3. The raw score distribution was divided into 15 intervals such that the two end intervals are open-ended, each of the other 13 intervals are 0.4 S.D. wide, and the middle interval, a scaled score of 8, is centered on the mean of the raw score distribution.
4. The raw score values corresponding to the end points of the 15 intervals were determined. (Note: the lower bound score for interval one is equal to 0 and the upper bound score for interval 15 is equal to the maximum possible score [the number of items]

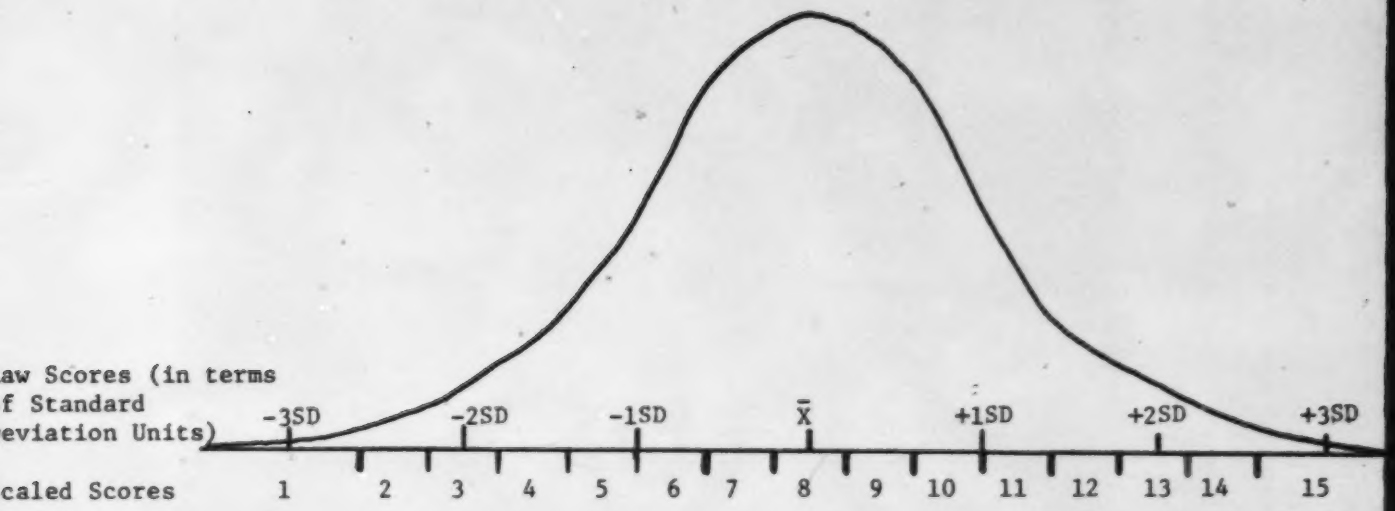
plus .1. The addition of .1 to the maximum possible score was necessary because of the computer algorithm used to assign scaled scores.)

Using the raw-to-scaled score conversion table developed in Steps 1 to 4, each examinee was assigned a scaled score on each area of assessment corresponding to the interval in which his/her raw score fell on that area, so that the raw score is equal to or greater than the lower bound and less than the upper bound of the interval.

The conversion of raw-to-scaled scores, in terms of raw score standard deviation units, is illustrated in the following figure.

Figure 1

Hypothetical Raw Score Distribution on
New MCAT Subtest with Corresponding Scaled Scores



EQUATING SUCCESSIVE FORMS OF THE NEW MCAT

Form 1 (Spring 1977) of the New MCAT will serve as the standard to which subsequent forms of the New MCAT will be equated. The primary approach to this equating task will be to construct successive forms by selecting items with known content and statistical characteristics so that the raw scores for the successive forms will be equivalent to the raw scores of Form 1 without having to perform statistical adjustments on the raw score distributions. To illustrate this idea from a slightly different perspective, it is possible to relate two sets of scores by means of the equation:

$$Y = aX + b,$$

where a and b are constants, and X and Y are scores of equal performance on two forms of the test. The goal in the construction of the New MCAT forms, if no statistical adjustments are to be made, is to construct these forms so that a equals 1 and b equals 0. When this is the case the same set of raw-scaled score conversion tables can be applied to the raw scores on all forms.

In order for this situation to result it is necessary that two conditions be met:

1. The parameters (difficulty indices, discrimination indices, inter-item correlations, content, etc.) of the items comprising each form must be equivalent.

2. The difficulty indices of all items, both currently available and to be developed in the future, must be based on a common, stable reference population.

To meet the second of these conditions the difficulty indices of all experimental items to be included in New MCAT forms, both those items now existing and those to be written, will be adjusted to a value which is an estimate of what the difficulty index would have been had the item been administered to the Form 1 (Spring 1977) baseline population of New MCAT examinees.

Because different sets of experimental items are administered to different subgroups of New MCAT examinees, a two step procedure is necessary to adjust the difficulty indices. First, the difficulty indices of the items are adjusted to what they would have been had they been administered to the entire population of examinees who took the particular New MCAT form in which the experimental items were included, rather than to a sample of this population (as is actually the case). Second, the difficulty indices

are further adjusted to what they would have been had they been administered to the Form 1 (Spring 1977) baseline population. These final adjusted difficulty indices will be used to construct all equated forms of the New MCAT.

In the construction of equivalent successive forms of the New MCAT, several conditions must be met if the same raw-to-scaled score conversion function is to apply. These conditions, which independently apply to each New MCAT subtest, must be held constant from form to form:

1. The total number of items in the subtest.
2. The distribution of item difficulties. (This automatically implies equal means and standard deviations of item difficulties.)
3. The distribution and number of items across content and/or skill areas.
4. The average inter-item correlations (Phi coefficients) both within and between content and/or skill areas.
5. The distribution of item discrimination indices.
6. The amount of reading required (number of words).
7. The total number of item response options. *

It is clear that if two or more forms of a test were constructed so as to meet all these conditions, and if the forms could be administered to a large sample of examinees simultaneously and in such a way that learning or fatigue did not occur during the testing, then except for random error, the different forms would correlate perfectly and would have the same means and standard deviations. Such a set of administrative conditions is impossible to obtain for the New MCAT. However, when such equivalently constructed forms are administered under comparable conditions, their means and standard deviations would not differ significantly and their intercorrelation would generally be equal to the average of their single form reliabilities. Under such conditions the use of a single set of raw-to-scaled score conversion rules is appropriate.

The seven conditions above are listed in decreasing order of importance. Conditions 1, 2 and 3 are of significantly more importance than the others and each of these three will be explicitly met in the construction of equivalent forms. Condition 4 is of moderate importance, though this condition can not be explicitly met since the total matrix of inter-item correlations is not known until after the final test is actually administered. However, previous research and preliminary studies indicate that when conditions 1, 2 and 3 are met, condition 4 is also reasonably satisfied. Therefore, in the construction of equivalent forms it will be assumed that condition 4 is being satisfied. This assumption will of course be subjected to verification as successive forms are administered. Conditions 5, 6 and 7 are of approximately equal importance and are of lesser importance than

* In assembling successive forms, care is also required to insure that there is not consistent pattern of position of the correct option such that a particular guessing strategy would be useful. This, however, does not affect the equating of the forms.

condition 4. In the construction of successive equivalent forms an attempt will be made to explicitly satisfy these last three conditions along with the first three. However, in cases where this may prove to be impossible, conditions 5, 6 and 7 may be violated slightly. Such variation should result in only minimal and non-significant effects on the final test score distributions.

APPENDIX A

GUIDELINES FOR THE CALCULATION OF LOCAL NORMS

The following set of computational instructions outlines procedures used by AAMC in the development of tables presented in describing group norms for New MCAT subtests. These instructions are detailed to make it possible for schools to develop data which have a comparable rationale. For purposes of illustration, a hypothetical Science Problems score distribution for 750 applicants to a first year class at medical school x is presented in Table A-1. To establish percentile rank range information and % of applicants scoring at a given scaled score level using these data, the following steps should be observed for each New MCAT area of assessment.

1. Record the number of applicants receiving each scaled score or frequency (F).
2. Express each frequency as a percent of the total number of applicants (N). For example, the number of applicants receiving a scaled score of 7 is 12% of 750.
3. Calculate the cumulative frequency (CF), or the number of persons scoring at or lower than a specified scaled score, by beginning at the bottom of the distribution, summing the frequencies (F) of each score falling at or below the scaled score in question (e.g., the CF for a scaled score of 5 equals the number of people scoring at 5 or below, or from Table A-I, 52 + 38 + 22 + 15 + 9).
4. Find the cumulative proportion (CP) by dividing each CF by the total number of applicants (N). To illustrate using example data, a scaled score of 5 has a CF of 136 associated with it and 136 divided by 750 yields a CP of .18.
5. To calculate the percentile rank (PR) ranges, multiply the CP values for each scaled score by 100 to obtain CP'. Each CP' value is the upper bound for each percentile rank range; the lower bound is one unit larger than the CP' value for the next lowest scaled score. For example, the CP' column in Table A-I, a score of 13 has a CP' value of 97; its corresponding percentile rank range is 94 to 97, where 94 is one unit greater than the CP' value for a scaled score of 12. Percentile rank ranges for the remaining scaled scores are derived in a similar manner. Since percentile ranks extend from 99.9 to 0, the upper limit of the PR range for a score 1f 15 will always be 99.9; the lower bound of a score of 1 will also always be 0.

TABLE A-I

ILLUSTRATED DATA FOR THE CALCULATION OF PERCENTILE RANK RANGES FOR A HYPOTHETICAL DISTRIBUTION OF NEW MCAT SCIENCE PROBLEMS SCORES

Scaled Scores	(1) F	(3) CF	(4) CP	(5) CP'	(2) % in each category	Percentile Rank Ranges
15	6	750	.999	99	1	99.3 - 99.9
14	15	744	.992	99	2	98 - 99.2
13	30	729	.97	97	4	94 - 97
12	53	699	.93	93	7	87 - 93
11	67	646	.86	86	9	78 - 86
10	83	579	.77	77	11	67 - 77
9	90	496	.66	66	12	55 - 66
8	112	406	.54	54	15	40 - 54
7	90	294	.39	39	12	28 - 39
6	68	204	.27	27	9	19 - 27
5	52	136	.18	18	7	12 - 18
4	38	84	.11	11	5	7 - 11
3	22	46	.06	6	3	4 - 6
2	15	24	.03	3	2	1.3 - 3
1	9	9	.012	1.2	1.2	0 - 1.2

Where it would be useful at the institutional level to calculate local norms, tables similar to that utilized in the above example should be generated for each of the New MCAT subsections. The calculation of local norms tables would be especially warranted when it is more useful for admissions committees to compare individual applicant performance with standards set at a particular institution rather than with national standards, and/or it would be of interest for the institution to compare its local score distribution with that of the national population of examinees or with the scores of specific national subpopulations. To avoid invalid or biased data, it is strongly recommended that local norm tables be based on a statistically determined minimum number of individuals. Small numbers may be especially problematic in attempting score comparisons among various subgroups.

Generation of the following local norm tables may be helpful in evaluating New MCAT scores of individual applicants or of groups of applicants:

1. Distribution of New MCAT scores of currently enrolled students. Percentile rank range information of all enrolled students can be readily kept current by eliminating data for students who are no longer registered (e.g., graduating seniors, dropouts, etc.) and adding those for the newly accepted class. Such data permits the comparison of each applicant's scores with those of any given class or with the entire current student body as well as with the national population of examinees.

2. Distribution of New MCAT scores of local applicants compared with appropriate national subgroups. Tables containing score distributions broken out by undergraduate major, sex and ethnic/racial categories may prove helpful in assessing particular applicant performance in relation to national and institutional groupings.

3. Distribution of scores of accepted applicants compared with rejected applicants. With few exceptions, the entering class of a given medical school will score higher on the New MCAT than the applicant group as a whole. The difference in scores of the two groups may be compared on a national basis and by subgroup where appropriate.